Charles University in Prague

Faculty of Social Sciences

Institute of Economic Studies

Master Thesis

2011 **Jan Hlaváč**

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The performance of the Czech Private Pension scheme: Current Design and its position within CEE countries

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Academic Year: **2010/2011**

Prohlášení

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Declaration of Authorship

Hereby I declare that I worked out this thesis independently, using only the listed sources and literature. I also declare that the presented work was not used to acquire any other academic degree.

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Prague, January 11, 2011 Jan Hlaváč

Acknowledgments

Here I would like to express my highest gratitude to doc. MPhil. Ondřej Schneider, Phd. for his willingness to supervise my work on this thesis. All of his valuable comments and suggestions were greatly appreciated.

I would also like to thank Ing. Jiří Rusnok for sharing his insights and offered help with the data gathering. My thank also goes to Dariusz Stańko, Ph.D., Nikola Abadjiev, Ph.D. and Damir Grbavac for their kindness to provide the data necessary for successful completion of this work.

Last but not least, I would like to thank my family and all the closest ones for providing me with unfailing care and patience over the time of my studies.

Abstract

This thesis focuses on the comparison of financial performance of the Czech voluntary private pension scheme with five other reformed private pension schemes in the region of Central Eastern Europe (Bulgaria, Croatia, Hungary, Poland and Slovak Republic). The current state and the recent development of the Czech private pension scheme are analyzed in the first part of the thesis. In the main part of this work we construct the dataset of periodic scheme returns covering the last decade, and estimate the schemes Sharpe ratios (SR) for four reference benchmarks. To complement the analysis we also employ the Sharpe style analysis to evaluate the impact of managerial decisions of market selection/timing on the scheme returns. The findings suggest that except for Poland none of the schemes managed to beat its long-term domestic benchmark (10-year government bonds) as the SRs estimates turn out to be negative. The highest underperformance was found in the case of Czech Republic. The results of style analysis suggest a modest positive influence of the active managerial decisions on the scheme returns with respect to the passive investment strategies.

JEL Classification	G23, G28, O57, H55
Keywords	Private pension schemes, Czech voluntary pension scheme, financial performance, Sharpe ratio, Sharpe Style analysis

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Bibliographic record

Hlaváč, Jan: "The performance of the Czech Private Pension scheme: Current Design and its position within CEE countries." Master thesis. Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, 2011, 107 pages. Supervisor: Ondřej Schneider.

Abstrakt

Tato práce se zabývá porovnáním finanční výkonnosti českého systému dobrovolného penzijního připojištění s dalšími pěti reformovanými penzijními schématy v regionu střední a východní Evropy (Bulharsko, Chorvatsko, Maďarsko, Polsko a Slovensko). Současný stav a nedávný vývoj českého systému je analyzován v první části práce. V její hlavní části pak byla shromážděna data výnosů všech porovnávaných penzijních systémů za poslední dekádu, aby pro každé schéma mohly být odhadnuty hodnoty Sharpe ratio (SR) vycházející z porovnání se čtyřmi vybraným investičními instrumenty. Doplňkově byla užita Sharpova analýza pro hodnocení dopadu aktivních manažerských rozhodnutí na výnosy schémat. Negativní hodnoty odhadnutých SR ukazují, že s výjimkou Polska žádné z penzijních schémat svými výnosy nepřekonalo výnosy desetiletých dluhopisů porovnávaných zemí. Nejslabší výkonnost byla zjištěna v případě České republiky. Výsledky Sharpovy analýzy dále poukazují na mírný pozitivní vliv aktivní manažerských rozhodnutí na výnosy systémů v porovnání s pasivními investičními strategiemi.

Klasifikace JEL	G23, G28, O57, H55
Klíčová slova	Private pension schemes, Czech voluntary pension scheme, financial performance, Sharpe ratio, Sharpe Style analysis

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Content:

List of tables:

List of figures

1. Introduction

The phenomenon of population ageing, occurring in many developed countries across the world, resulted into the shift in traditional understanding of the role of state in the economics of pension. The shift was augmented by the World Bank (1994) report, which came out with the recommendation to base the countries pension system on 3-pillars. The message was clear. It suggested to diversify the sources of pension system financing by introducing mandatory (II. pillar) and voluntary (III. pillar) pension schemes. This shift in understanding was accompanied by the gradual move towards diverse pension arrangements where the future pension provisions are backed by the assets.

Under such an arrangement, the level of future pensions (paid out from this scheme) becomes directly dependent on the annual rates of returns generated by the assets of the scheme participants. Thus, the (under)achievement of the scheme shall be derived from the ability of the scheme to generate sufficient returns that would facilitate the adequate pension provisions in the future. This leads us to the pension scheme financial performance evaluation. In the academic literature, this area has not been examined extensively yet for various reasons. In fact, the impulse for the development of pension specific evaluation framework tracks back to Campbell and Viceira (2002). In their work, the long-term investment horizon and objectives of pension industry (to deliver adequate levels of future pensions) were emphasized in contrast with the other forms of collective investment that are primarily concerned with the short-term profit maximization. This means that to compare the monthly or quarterly scheme returns may not be totally meaningful, unless measured against a (set of) specific benchmark(s) that reflect on the above mentioned characteristics.

The joint research project of Organization for Economic Co-operation and Development (OECD) and World Bank (WB) 2007-2010 is by far the most comprehensive published study that focused on the comparison of the financial performance of respective private pension schemes. As a core part of the program output, the initial assessment of financial performance of private pension schemes in OECD countries was delivered. In total, 23 countries with available historic data

entered into this comparison. In my thesis I will take the advantage of the built-up methodological background delivered by the research program to compare the financial performance of the Czech voluntary private pension scheme with other reformed schemes within the Central-Eastern Europe (CEE) region.

The Czech voluntary private pension scheme, which is going to be analyzed in this study, has been implemented in 1994. The scheme could be described by the following characteristics. Up to date, it has reached a significant coverage exceeding 70 percent of total workforce. Maturity of the scheme brings the economies of scales, and it gets relatively cheaper to operate the scheme. Also the increasing engagement of employers could be perceived as a clear accomplishment. On the other hand, the decreasing average contribution rate (relative to the gross wage), and high levels of acquisition costs could be treated as current threats that might prevent the scheme from the successful future evolution. The aim of this work is to come up with the comparative analysis of the financial performance of Czech voluntary private pension scheme with other private pension schemes in chosen CEE countries that reformed their pension systems recently.

The structure of this study proceeds as follows. This introductory chapter will be followed by the detailed analysis of the Czech voluntary private pension scheme. The analysis will examine the legislative arrangement, its general characteristics and market situation. This analysis will later serve as a standpoint for the scheme financial performance evaluation. The main body (third chapter) of this work will provide the comparison of the financial performance of Czech pension scheme with other reformed[1] pension schemes in the CEE region for which the historic data were accessible. Chapter 3 opens with discussion focusing on the motivation for the financial performance evaluation, and proceeds with the description of the methodology employed for this kind of analysis. Further, the pension schemes of the countries entering into the analysis will be shortly introduced. Final section of the Chapter 3 will serve for the presentation and discussion of the obtained results. Chapter 4 concludes.

[1] The reformed pension scheme (for the sole purpose of this work) is defined as the pension scheme that over last two decades introduced (in the World Bank 1994 terminology) its 2nd and/or 3rd private pension pillar.

2. The voluntary private pension scheme in the Czech Republic

In the following chapter the analysis of the Czech private pension scheme will be provided. In the line with the World Bank (1994) proposal to complement fiscally challenged state pay-as-you-go system by a capital-market element, the Czech Republic has introduced its third pension pillar (in WB terminology). However, so far, due to the various reasons, it has never implemented the second pension pillar. The ambition of this work is not to analyze the reasons for not introducing a complete pension reform but rather to answer the question whether what has been done so far brought any additional value from the perspective of future pensioner. In order to come up with the answer on this question the following chapter focuses on the analysis of the Czech voluntary private pension scheme.

The scheme was introduced in 1994, and since then it has gone through significant process of development. Despite its voluntary participation, up to now the participation rate exceeded 70 percent of total workforce and by 2010 the scheme managed to gather assets amounting to CZK 215 bn. (equivalent of 6 percent of Czech GDP). This alone can be treated as a success.

However, it does not prevent us from asking legitimate question whether the scheme fulfilled its original purpose, which is to deliver an increased wealth in terms of the future pension paid out to its participants. For this purpose, a comprehensive analysis leading to identification of past trends, current state and future outlook is essential. The examination of valid legislation and current market situation will help us to understand what are its current limitations, and potential obstacles that hinder its future development. These findings, together with findings of the next chapter focusing on the empirical comparative analysis of financial performance of the scheme with other private pension schemes within CEE region, will provide the arguments for policy recommendations concerning its future development. The chapter proceeds as follows: First, the current legislation for voluntary private pension scheme is to be presented. Further, its general statistics (scheme coverage, average contribution, age and sex distribution, employer scheme participation) will be identified. Finally, the analysis of the market situation focusing on individual PFs, and the description of their respective financial performance will be provided.

2.1. Legislative arrangements

The following section will be dealing with current legislation in the area of voluntary private pension scheme. Such an overview is important for two reasons: First, the legislation burdens the scheme with a number of regulatory restrictions, which directly influences the behavior of PFs. Second, it is also convenient to overview the current legislation for the sole purpose of pension system design efficiency evaluation. The observations (and their international comparison) then will be used as a subject of further discussions.

The origins of the private pension scheme in the Czech Republic date back to 1994 when the Czech parliament approved The State Contributory Supplementary Pension Insurance Act[2] (SCSPIA). The SCSPIA sets forward the regulatory framework for pension fund activities in the Czech Republic. The scheme was initially proposed in order to provide citizens with (supplementary) option to gather their additional savings for the future retirement outside of the traditional PAYG system. The participation in the system is voluntary. Any permanent resident of the Czech Republic older than 18[3] is allowed to participate in the private pension scheme through signing the contract with any of the established voluntary private pension funds (PFs).

2.1.1. Licensing

The SCSPIA and other related Acts regulate the conditions under which PFs can operate. PFs are established as joint stock companies with minimal amount of initial capital CZK 50 mil. For its establishment and day-to-day operations, the license from the Czech National Bank (CNB) needs to be obtained. Before the license is granted, CNB asks for the approval the Ministry of Labor and Social Affairs. The approval is granted under the condition that regulator's demand for professional capabilities of statutory body members (Board of Directors, Board of Trustees) is satisfied. Also the approvals of statute proposals, pension plans proposals, and depository bank proposal are of the integral part of license granting process. Interestingly, the

[2] Act No. 42/1994 Col.

[3] The participation in the system is also allowed to the individuals older than 18 years of age with permanent residency in other EU states under the condition that this individual is a part of the Czech social security system or health insurance scheme.

SCSPIA places restrictive conditions on the PF' board membership in order to prevent the potential conflict of interests[4].

2.1.2. PF statute and pension plan

Each PF needs to have its own status and pension plan. Their primary features (and also any change of these) need to be approved by CNB. Statute of PF defines the scope of activities where PF will operate, focus and the goals of its investment policies together with the rules for the profit distribution, and other activities such as establishing rules for reporting of results. In other words, statute creates the basic set of rules that PF needs to always comply with when operating.

Any pension plan in the voluntary private pension scheme in the Czech Republic is settled as defined contribution pension plan (DC). That means the amount of pension paid out to the participant depends on the total sum of individual contributions gathered, participant's share on the PF investment yields during his participation, and the age of individual to which the pension is going to be paid[5]. In total, four types of pensions (the same as in PAYG scheme) can be offered by pension plan: retirement pensions, old-age pensions, disability pensions, and widow pensions.

Each pension plan needs to specify the types of pensions offered by the given PF, further it needs to arrange the conditions that participant needs to comply with so that the reimbursement can be executed. Moreover, every pension plan needs to clarify the method used for the calculation of monthly pension payments, the reasons enabling the contract renouncing, and other conditions that are connected with individual contributions.

2.1.3. Conditions for contract origination and termination

The participation in the scheme is initiated by signing the contract between an individual and PF. Only one valid pension contract with given PF is allowed to be held. When signing the contract, client needs to be informed by the contracting authority (PF, agent, broker, etc.) about important terms of contract including any

[4] The membership of any depute, senator, employee of PFs regulatory bodies (e.g. CNB), member of statutory bodies of other PFs, Investment funds, Insurance companies, banks, and broker companies in the statutory bodies of PFs is prohibited. Also, the member of the board of trustee can't be an employee of PF.

[5] SCSPIA allows the defined benefit pensions (DB) for disability and widow's pension. In that case the amount of pension paid out by PF is explicitly stated in the individual's contract. If DB plan is in place, it needs to be held separately as a separate plan.

contract-related fees, remuneration amount for contracting authority and other related costs of PF. Also, the contracting authorities cannot offer any financial or non-financial benefit which could lead to violence of the obligation to act in the best interest of client, neither to provide misleading information about the character and pension supplementary insurance attributes.

The contract may be terminated by PF in the case client has not contributed over 6 consecutive months period. Also, the contract may be cancelled by PF when client provided PF with invalid information at the time of contract origination or in the case when the client ceased to fulfill the conditions for participation in the system.

2.1.4. Claims from the contract

The contract offers three types of benefit compensation: periodically paid out retirement pension, lump-sum settlement and severance payment. The conditions for any client's claim on pension payment vary within the allowed limits based on the preferences of individual PFs. Since 2001 the minimum age for claim to old-age pension is 60 years of age with no difference for man/woman. Based on the PFs choice, the claim on the old-age pension arises after 60-120 months of insurance period. The claim on the retirement pension originates by earliest after 180 months of participation in the scheme, and the client is eligible for the invalid pension after 36 months. The claim on severance payment arises after realization of 12 monthly contributions. It is possible to transfer the means[6] from one pension fund to another. Since 2009, the PFs may charge up to CZK 800 for the transfer[7] as well as for the severance payment.

2.1.5. Contributions

Participant is obliged to pay monthly fixed contributions (minimum allowed contribution is CZK 100) to one of the authorized PFs. The change of the monthly contribution is possible. The employers and third parties are allowed to contribute to the client's account. However, the level of state subsidy is not linked to the employer payments. The employer cannot influence the employees in their choice of respective PF nor can accept any incentive in the sense described in 2.1.3.

[6] The transfer also includes the state contributions.
[7] The charge may be applied only on contracts with duration not exceeding 60 months.

The Czech state provides the subsidy to all scheme participants. Its level is derived from the level of monthly (or average monthly) contribution. The agenda of the state subsidy is administered by the Czech Ministry of Finance, and PFs apply for the state subsidies quarterly. The PF is obliged to record these provisions and to manage them identically as the contributions paid by clients. The SCSPIA allows government to increase subsidy levels. Current levels of the state subsidy (documented in the Table 1) are in place since 2001.

Table 1: The level of state subsidies for PSI in 2009

Individual contribution per month	State subsidy per month
100 – 199 CZK	50 CZK + 40% from contribution above 100 CZK
200 – 299 CZK	90 CZK + 30% from contribution above 200 CZK
300 – 399 CZK	120 CZK + 20% from contribution above 300 CZK
400 – 499 CZK	140 CZK + 10 % from contribution above 400 CZK
>500 CZK	150 CZK

Source: Ministry of Finance, Department of Pension Supplementary Insurance

The PF needs to hold an individual account for each participant. All means gathered in the participant account need to be separated into three subaccounts: clients' contribution, employer's and third parties' contribution due to their different claims on state subsidy and taxability. Also, the state contributions and the shares on the PF investment performance need to be tracked separately for different tax regimes.

More specifically, the individual contributions are tax free. Furthermore, a privileged tax of 15% is levied on the employer's contributions. The third parties contributions are tax free. Also the tax of 15% is imposed on the capital gains at the time of withdrawal. Above these tax burdens, the participants may use the possibility of CZK 12 000 tax base reduction when reaching the total annual savings of CZK 18 000[8].

2.1.6. Portfolio structure – regulatory framework for PFs investment policies

As stated in the Act, the SCSPIA allows PFs to invest into the most of the accessible assets such as state bonds, corporate bonds, mutual funds, shares, real estates, and

[8] Generally speaking the tax environment of the scheme corresponds with the so called EET system where both contributions as well as the future pensions are tax free.

property[9]. In fact, this legal definition does not prevent PFs to invest into the most of the financial instruments traded in the Czech market. When any financial instrument is being acquired, the buying price must correspond to the lowest attainable market price, on the other hand, the sale of the instrument needs to be realized through the highest market price available at a given moment. PFs are also allowed to place its assets into bank accounts. However, the deposited amount is limited to CZK 20 mil. per one bank.

SCSPIA limits the amount of assets that can be invested into single instruments and it also imposes the restrictions on portfolio structure. The value of assets invested into the instruments of single emitter cannot exceed 10percent[10], and the total value of assets invested into real estate and property cannot exceed 10 percent. The sum of investment into mutual funds, shares, real estate and property cannot exceed 70 percent of total assets. Investment into other than above mentioned instruments (excluding state and corporate bonds) is limited to 5 percent. PFs are not allowed to hold more than 20 percent of publicly traded papers issued by a single emitter. Concerning the currency issues, the share of assets denominated in domestic currency in PFs portfolio is not allowed to drop below 50 percent of total assets. PFs are not allowed to buy the shares of other PF nor issue own bonds. If, for any reason, PF ceases to comply with any of these limits, it needs to inform CNB immediately. Short-term hedges, such as the use of derivatives or options, are allowed only for the sole purpose of lowering different market risks (e.g. interest rate or currency risks).

2.1.7. Profit Distribution

The distribution of PF profit is also arranged by SCSPIA. At least 5 percent of the generated profit goes directly into the reserve fund. The board of directors then decides about the distribution of maximum 10 percent of profit, which may go to clients or to the shareholder of the PF. The remaining amount (minimum 85 percent) is distributed to the PFs clients.

Importantly, when PF experiences a financial loss (net annual profit ≤ 0) over the fiscal year, the loss will be reimbursed from the means of PFs reserve fund or other funds created from the profit generated in previous years. If these means are not

[9] SCSPIA also allows PFs to invest into foreign (only OECD) markets.
[10] This exposure limit does not hold for the government bonds.

sufficient to cover the financial loss, the remaining amount will be paired up with the drop of its equity. However, the total amount of equity cannot fall below CZK 50 mil. In that case the shareholder needs to add up its own capital if the continuation of the PFs activity is the desired outcome. Thus, even if the minimum return is not guaranteed explicitly, the SCSPIA poses the requirement on PFs shareholders to compensate its clients for any PFs negative returns.

This requirement prevents the scheme members from suffering any financial losses in the given fiscal year. However, this requirement also significantly lowers the potential of higher portfolio returns. In practice, an implicit demand for portfolio structure with large share of secure investments (mainly the government bonds with low but well predictable returns) comes into play so that the probability of negative annual return is minimized at any point of time. In fact, even if the minimum return is not legally guaranteed, the SCSPIA, by posing the requirement of loss compensation, provides that guarantee implicitly.

2.1.8. Oversight and supervision

There are two main scheme regulatory bodies. The regulatory oversight of PF activities is granted to the CNB, whereas Ministry of Finance is given the authority to supervise the activities connected with the agenda of state subsidies. Both regulatory bodies may require additional information for the proper execution of oversight and supervision. Also, both bodies may impose a maximum fine of CZK 5 mil. for not complying with the conditions imposed by SCSPIA[11]. The fines would be covered by lowering of the PFs annual profit.

The SCSPIA also imposes an obligation on PFs to report its financial results twice a year. Also the portfolio structure and the size of its components should be reported to CNB, Ministry of Finance and its depositor. The PFs that operate for longer than three years period are required to publish the results of their investment activities for the last three annual periods. For any merger or spin-off there needs to be an approval from CNB. In the case of cancellation without any legal successor, the PF clients' claims will be satisfied through the lump-sum settlement or severance payment.

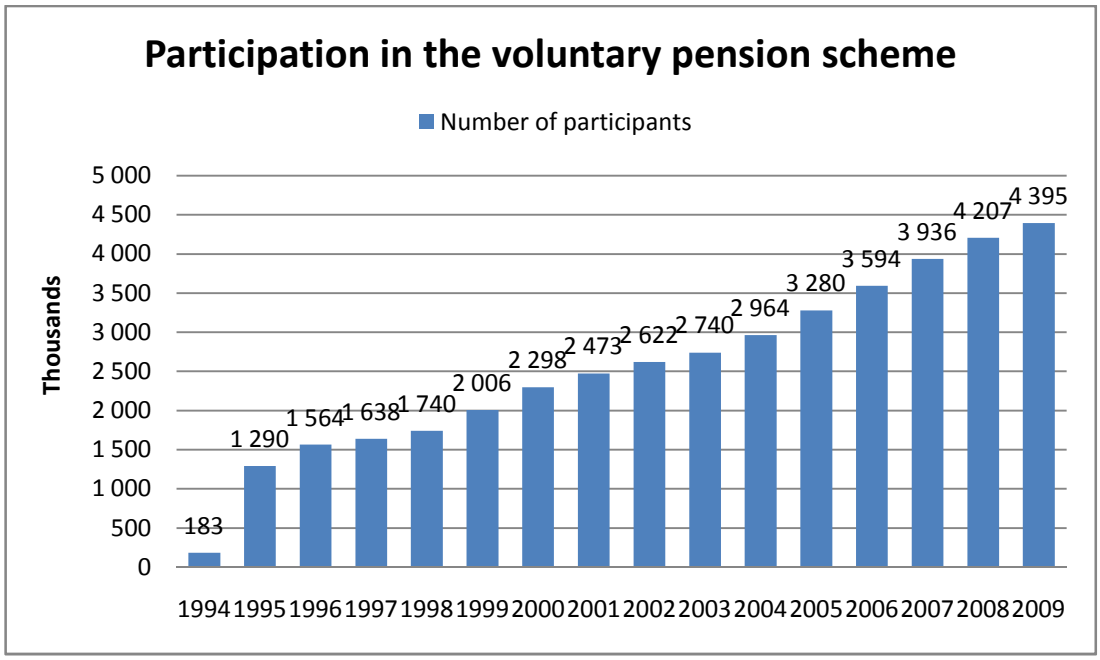
[11] CNB may impose a fine of CZK 20mil. when company is operating as PFs without the proper license.

2.2. Basic characteristics of the Czech voluntary private pension scheme

2.2.1. Participation in the scheme

Since its origin in 1994 the private pension scheme in the Czech Republic has experienced significant development (see Figure 1 below). So far, every year the number of participants has risen. Its coverage moved from 1.3 mil. in 1995 and it peaked at almost 4.4 mil. participants by the end of 2009. That is over 82 % of the total workforce[12]. Although the number is expected to grow in the near future however, the pace of growth is currently slowing down as the market already attracted most of its potential members. Since 2005, when then the y/y change of total number of participants peaked at 10.6 percent, the pace of growth is declining steadily, and it leveled-off at 4.5 percent in 2009.

Figure 1: Number of participants in voluntary private pension scheme in the Czech Republic



Data source: The Czech Ministry of Finance

[12] According to data from Czech Statistical Office the total workforce of the Czech Republic in Q4 2009 was 5 307 thousands. However, the scheme does not exclude current pensioners out of the participation, and their share amounts to 800 thousands. Thus, the participation rate of economically active workforce exceeds 70 percent.

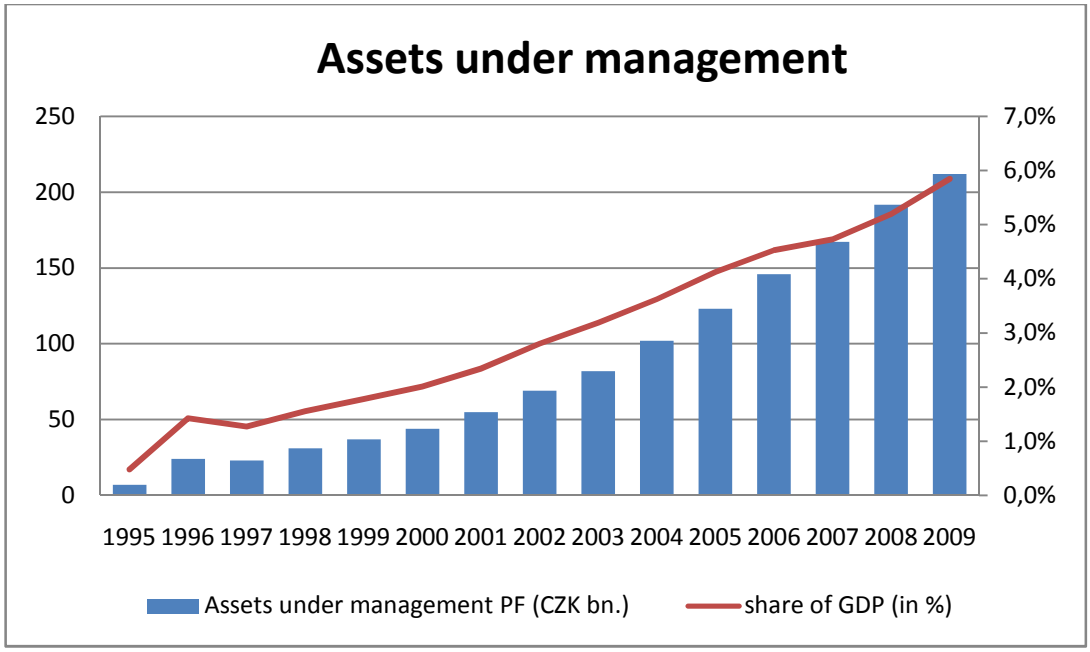
2.2.2. *The size of the sector*

The development of the size of Supplementary Pension Insurance sector is captured in the Figure 1. Since 1994 the sector has accumulated over 215 bn. CZK that are placed in individual client's accounts. In the initial period, from 1994 till 2001, the scheme attracted around one forth of nowadays amount (CZK 55 bn.). The remaining three fourths of accumulated amount were brought in the period 2002-2009.

Several factors stand behind this development. First, the number of participants was increasing steadily, which brought continuously new contributions into the system. Second, the rise in the rate of state subsidy introduced in 1999 motivated clients to larger average contributions. Third, the legislative tax arrangement enabling employers to offer employees the tax deductive employee benefit brought another significant motivational factor into the system.

As the size of the sector was rising, so was the relative size of voluntary private pension scheme with respect to national GDP. Currently, the Czech pension funds hold over 6% of the Czech GDP. This share is expected to grow in the short term and medium term as there will be a constant inflow of participant's contributions, and a modest growth of coverage. However, in the long term the market consolidation is expected to occur as the pay-out phase will be triggered for the higher age cohorts.

Figure 2: Development of the assets under management of Czech PFs

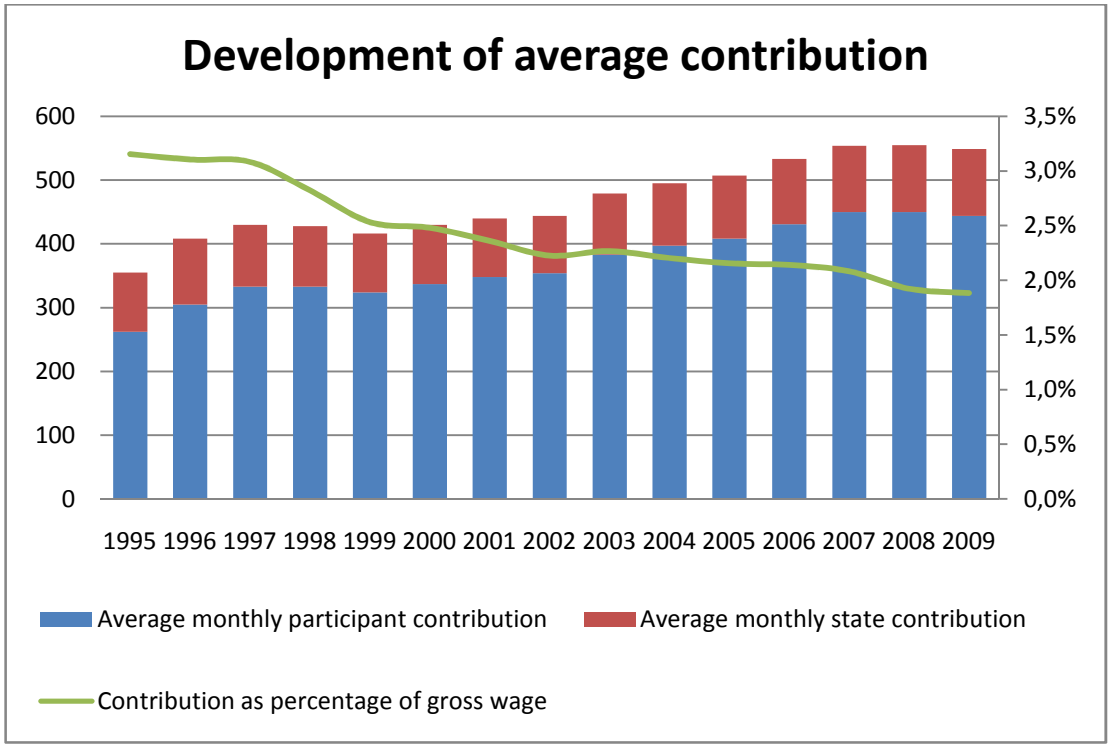


Data source: Ministry of Finance, CNB, Czech Statistical Office

2.2.3. *Average monthly contribution*

As documented in Figure 3, the average monthly contribution consisting of clients' contribution and state subsidy has been increasing steadily over the observed period. The average participant's contribution has almost doubled since 1995 as it peaked at 450 CZK in 2009. On the other hand, the state subsidy remained stable over time, experiencing only a small increase. Both combined stand for an average monthly contribution of CZK 555 in 2009.

Figure 3: Average monthly contributions of participant and the average state subsidy



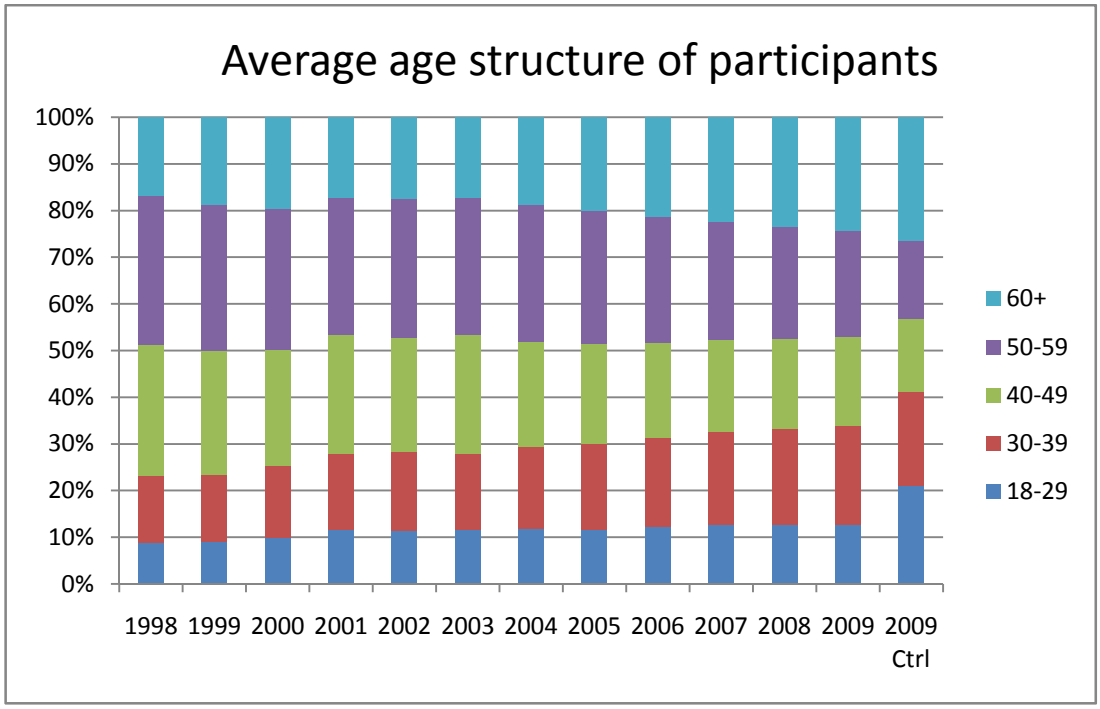
Data Source: Ministry of Finance, Czech Statistical Office, own calculations

Although the average monthly contributions were rising steadily, an average participant tends to put aside smaller amount relative to the gross wage over time. This trend is also documented in Figure 3. Since the origin of the voluntary private pension scheme, the average contribution into the system relative to an average gross wage has been decreasing steadily. In 1995 participants saved up to 3.2 percent of the gross wage (with state subsidy the level was 4.3 percent), however since 2001 the relative engagement in the scheme leveled off as participants have been putting aside around 2 percent of the gross wage.

2.2.4. Distribution of participants (age, sex)

The age structure of the scheme participants is documented in the Figure 4. A couple of important trends are to be identified from development of the participants' age distribution. Since 1999, the combined share of age cohorts 18-39 has been increasing steadily. Over the last decade, this share has increased by 11 percentage points as it peaked at almost 34 percent in 2009. This reflects on the partial change from the initial state as described in Jelinek and Schneider (1997), where the age structure of participants was described as significantly biased towards the older generation. An increasing interest of supplementary pension insurance among younger age cohorts may signal the shift in understanding of the initial role of the scheme: being a complementary tool to the state PAYG pension.

Figure 4: The age structure of the voluntary private pension scheme participants



Source: Ministry of Finance, Czech Statistical Office

On the other hand, the share of 60+ age cohort has been increasing steadily since 2003. Since then it has gained over 7 percentage points, and it reached over 24 percent share in 2009. These are the participants whose claims over their means have matured, and where the pay-out phase will be initiated in the close future. Finally, a partial downward shift in the relative size of age cohort 50-59 may indicate on the change in perception of supplementary pension insurance as a short-term investment

instrument. In 1998 this cohort represented almost 32 percent of all participants. The presence of the state subsidy connected with the possibility of short-period earnings has been the motivation for entering the system (as opposite to the share on the PFs profit). Currently the relative size of this cohort reaches 24 percent, which is a shrink of almost 8 percentage points.

For better understanding of the participants' age distribution the control (ctrl) representing the Czech population distribution was also included in the Figure 4. The comparison of age structure of PFs clients and the Czech population distribution underlines that all three trends identified above (relative increase in age cohorts 18-39 and 60+, and decrease in age cohort 50-59) are in the line with the age distribution of the Czech population. Thus, it is reasonable to expect that these trends will continue to appear also in the near future.

To sum up, the working age population involvement in the scheme is high and is expected to further grow. The involvement of younger age cohorts (18-39) was increasing over time. On the other hand, the engagement of 50-59 age cohorts was decreasing steadily. Both changes have been moving the voluntary private pension insurance towards more evenly distributed participation of the Czech population in the scheme. This might reflect on the shift of attitude towards the understanding of the supplementary pension insurance as a means for long-term investment.

2.2.5. *Employer contributions*

The legislative arrangement allows the participation of employers in the scheme. Since the employers are allowed to deduct the contribution from their tax base, the incentive to employers' participation in the scheme is laid. The development of the employer's engagement in the scheme is documented in Table 2. Since 2000, the amount of clients with employer's contribution has tripled, and in 2009 it reached the total of almost 1.3 million. Expressed in the relative terms, the share of participants with employer contribution on total number of participants has increased from 18.1 percent in 2000 to around 29 percent which proved to be the stable relative share. Thus, the stream of the employers' contribution in the scheme has become an important factor leading to the faster growth of the sector.

Table 2: Employers participation in the voluntary private pension scheme

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of participants (thousands)	2 298	2 473	2 622	2 740	2 964	3 280	3 594	3 936	4 207	4 395
With employers contributions	416	568	650	728	802	928	1 029	1 130	1 223	1 262
In %	18,1	23,0	24,8	26,6	27,0	28,3	28,6	28,7	29,1	28,7

Data source: The Association of Pension Funds of the CR Annual Reports (2000-2009)

2.3. Description of the market situation

2.3.1. Current market situation

Since 1994, the Czech pension funds market has gone through significant development. In the period 1994-1996 the Czech Ministry of Finance together with the Czech Ministry of Labour and Social Affairs granted the permission to operate in the market of pension supplementary insurance to 44 pension funds. Indeed, it was followed by the process of rapid market concentration as in 2002 there have been only 13 active pension funds left, 6 largest funds held 83 % of total assets[13]. As visible in Table 3, in 2009 there were 10 pension funds active in the Czech market.

Table 3: Summary of active PFs operating in the Czech market in 2009

	The name of pension fund	Shareholders structure above 10 %
1	**AEGON Penzijní fond, a.s.**	AEGON Tsjechië Holding B.V. - 100 %
2	**Allianz PF, a.s.**	Allianz pojišťovna, a.s - 100 %
3	**AXA penzijní fond a.s.**	AXA Life Ltd., Švýcarsko 37,11 %
		SOCIETE BEAUJON, Francie 55,74 %
4	**ČSOB Penzijní fond Progres, a. s**	Československá obchodní banka, a.s. - 100 %
5	**ČSOB Penzijní fond Stabilita, a. s.**	Československá obchodní banka, a.s. - 100%
6	**Generali PF, a.s.**	Generali Pojišťovna, a.s., ČR – 100 %
7	**ING Penzijní fond, a.s.**	ING CONTINENTAL EUROPE HOLDINGS B.V. – 100 %
8	**Penzijní fond České pojišťovny, a.s.**	Česká pojišťovna, a.s. – 100 %
9	**Penzijní fond České spořitelny, a.s.**	Česká spořitelna, a.s. – 100 %
10	**Penzijní fond Komerční banky, a.s.**	Komerční banka, a.s. – 100 %

Data source: The Association of Pension Funds of the CR 2009

Further, the process of system internationalization has occurred in the market. In the initial period of market development, most of PFs shareholders were of domestic origin, in 2001 the international shareholders held up 50 percent of total assets, and since 2009 all shareholders are components of strong world-wide financial concerns

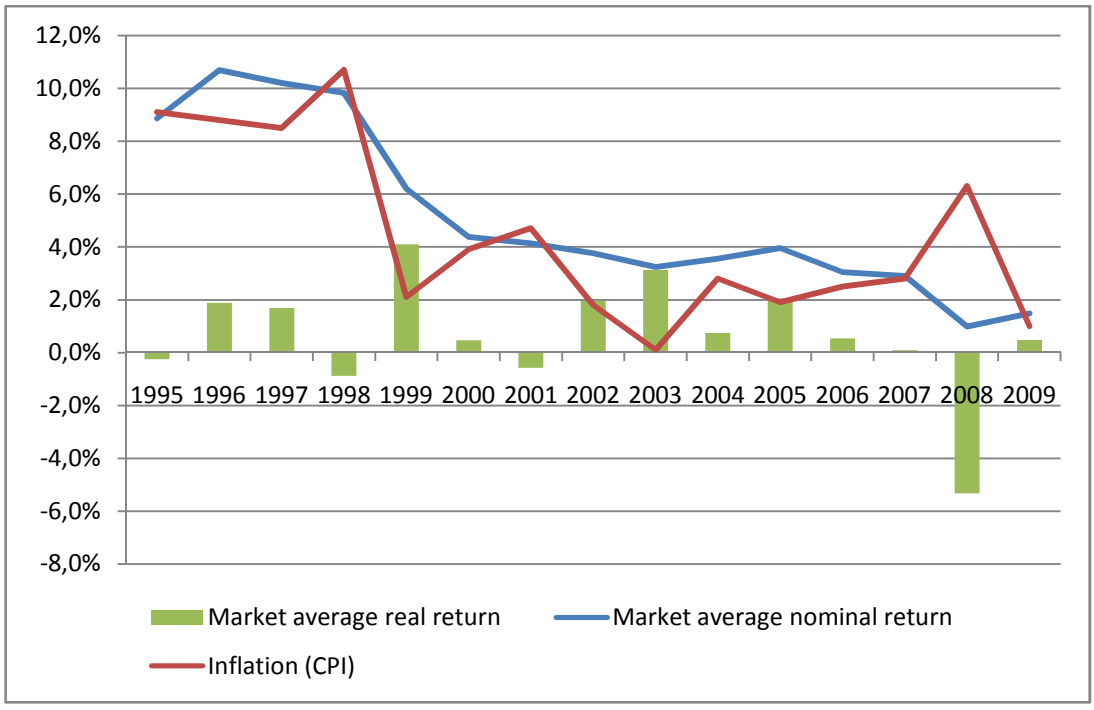
[13] http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/dohled_financni_trh/souhrnne_informace_fin_trhy/archiv/penzijni_fondy/VZ_PF_2002.pdf

(representing banking/insurance sectors). These two characteristics (market concentration and internationalization) might have been important aspects granting the stability of the system resulting into high total coverage.

2.3.2. Financial performance of the Czech private pension funds

In the following passage the brief description of financial performance of the Czech private pension funds will be presented. The figures entering into the analysis are the annual returns that have been credited to the participant accounts. These returns stand for at least 85% of PFs annual profit, as 5% of annual profit goes into the reserve fund and the board of directors decides about the distribution of remaining 10%. The pension funds entering into the analysis are the ones active in the end of 2009. Figure 5 represents the average nominal and real market returns in the given year (includes inflation-adjustment).

Figure 5: Average nominal and real annual returns of Czech voluntary private PFs



Data source: The Association of Pension Funds of the Czech Republic, Czech Statistical Office, own calculations

A couple of important findings concerning the financial performance of the scheme could be drawn from the Figure 5. First, the average nominal returns have been falling since the introduction of the scheme. In the first five years of operation the

scheme delivered in average 9 percent annually, between the years 2000-2004 it was almost 4 percent and since 2005 the scheme delivered an average annual return over the level of 2,5 percent. Second, the positive real returns have been delivered for most of the period observed. In fact, besides the initial year of operation, there are three other years when the real returns turned up to be negative (1998, 2001 and substantially in 2008). Indeed, these were the periods of lowest economic performance when PFs realized the losses due to the unfavorable macroeconomic conditions. The legislative condition promising the positive nominal returns, which lead to the strictly conservative portfolio allocations, prevented the system from significant losses experienced by foreign PFs in 2008 and 2009[14]. Finally, the Figure 5 shows that the average annual y/y changes of nominal returns are lower than the changes in inflation rates. Thus, the levels of the real annual returns are relatively randomly (and evenly) distributed in time.

In total, the financial results are not very positive. After first five years of positive financial performance, the levels of returns were decreasing continuously in the following decade. Possibly, the lowest acceptable benchmark in the form of positive average real annual returns was beaten most of the time. The financial performance of the scheme will be further analyzed in the following chapter, where results will be compared with several other benchmarks and with the results of other reformed schemes.

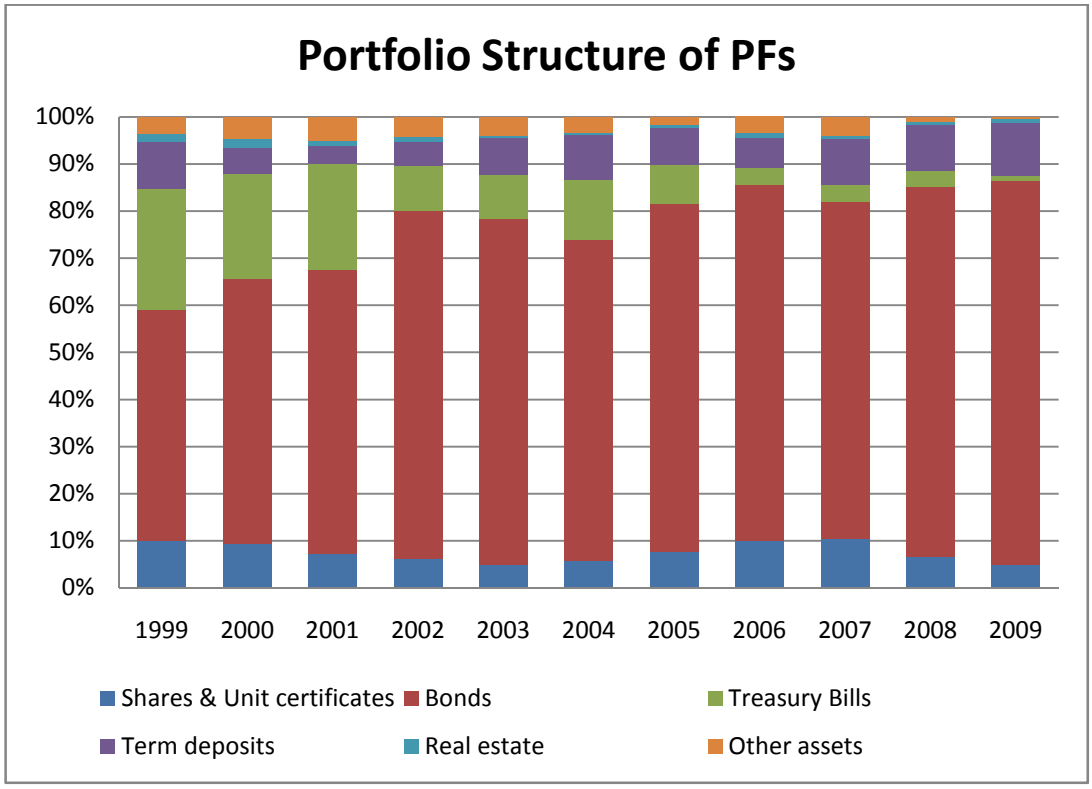
2.3.3. Portfolio structure

There are few legal regulations imposing limits on the exposure to the respective asset classes within the PFs portfolio[15]. In practice, however, these limits do not have significant influence on the portfolio structure. The development of the PFs portfolio structure is documented in the Figure 6. As visible, the bonds together with treasury bills stand for the largest share of PFs portfolio. In 1999 both combined stood for almost 75 percent of the total portfolio size, which was also the lowest share reached in the past decade. On the other hand, the highest share of bonds and treasury bills was reached in 2008 as it topped at 85 percent. Since 1999, the combined share of PFs investments into shares, unit certificates, real estate and other instruments potentially offering a higher return, has not exceeded 16 percent. The lowest

[14] See chapter 3 for more information
[15] See the section 2.1.6.

representation of these instruments in PFs portfolio was reached in 2009 at the level of 6.2 percent.

Figure 6: The development of the Czech Pension Funds portfolio structure



Data source: The Association of Pension Funds of the CR Annual Reports 1999-2009

Together with term deposits, bonds and treasury bills are seen as the most secure investments instruments. On the other hand, the potential return reached on these investments is relatively low compared to other more risky instruments. The main driver for the conservative structure of PFs portfolio over time is another legislative arrangement, which imposes an obligation on PFs shareholder to compensate any negative return on PFs portfolio[16].

2.3.4. Operating expenditures of Czech PFs industry

In the following section the cost position of industry during the last decade will be analyzed. Indeed, the efficiency under which the individual PFs operate is essential as it directly influences the financial performance of the whole scheme. Importantly,

[16] See the section 2.1.7. for more on voluntary pension funds legislation for more on PFs guarantee of positive return.

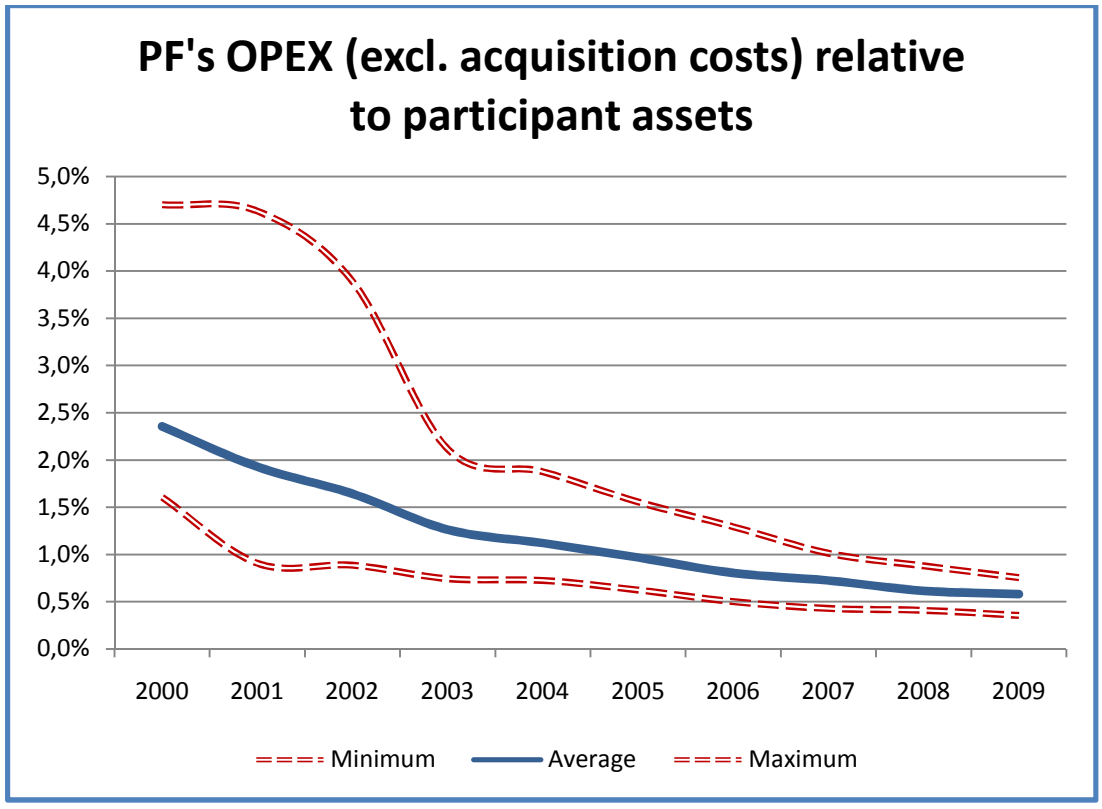
the legislation does not impose any legal limits on individual cost items. This was the reason for initial high relative operating expenditures level.

In total, there are nine PFs entering into the analysis. These are the funds which were active over the whole observation period. There are two main sorts of operational expenditures. These are the administrative costs and the acquisition costs. Also, the acquisition costs amortization is going to be analyzed in this section.

2.3.4.1. Administrative expenditures

Administrative expenditures are spent on the day-to-day activities of PFs, and include mainly salaries of PFs employees, marketing costs, rent, etc. It is reasonable to expect that the relative importance of these costs will start to decrease once the sector starts to expand (increase in AuM) as the economies of scales will likely occur. On the other hand, once the scheme will get closer to market saturation, it is likely the decrease of administrative costs will slow-down up to the point until it levels-off. The development of administrative costs of Czech PFs over last decade is presented in Figure 7.

Figure 7: Operating expenditures of Czech PFs without acquisition costs (excl. Aegon PF)



Source: author's calculation; data source: Annual reports of Czech pension funds 2000 – 2009

Annual reports of 9 Czech pension funds from the period 2000 – 2009 were used as a data source for the construction of Figure 7. For each year the data of PFs operational expenditures were spotted. Their absolute values were compared with the participant means of each respective fund so that comparable relative values of OPEX could be obtained. Further, for each year the maximum and minimum values together with average value of OPEX were counted so that the curves of minimum, maximum and average OPEX curves could be obtained. Finally, all three curves were smoothed for the purpose of easier comparison.

After the process of market concentration in late 90s, when through various merging activities the larger PFs acquired the smaller ones, the situation in private pension sector delivered a stable number of pension providers. Since then, the PFs focus moved towards a delivery of increasing operational efficiency. Keeping in mind similar portfolio placement strategies (delivering similar financial returns), an increased efficiency has been the first natural step for PFs to gain the comparative advantage over its competitors. Indeed, the scheme also benefited from its internationalization as the Czech PFs became a part of strong bank/insurance groups. In order to become more competitive, shareholders often prevented PFs from additional costs, for which they would have been charged other vice. Regardless of its source, the presence of economies of scale resulting from increased competitive pressures over the last decade is apparent from the Figure 7.

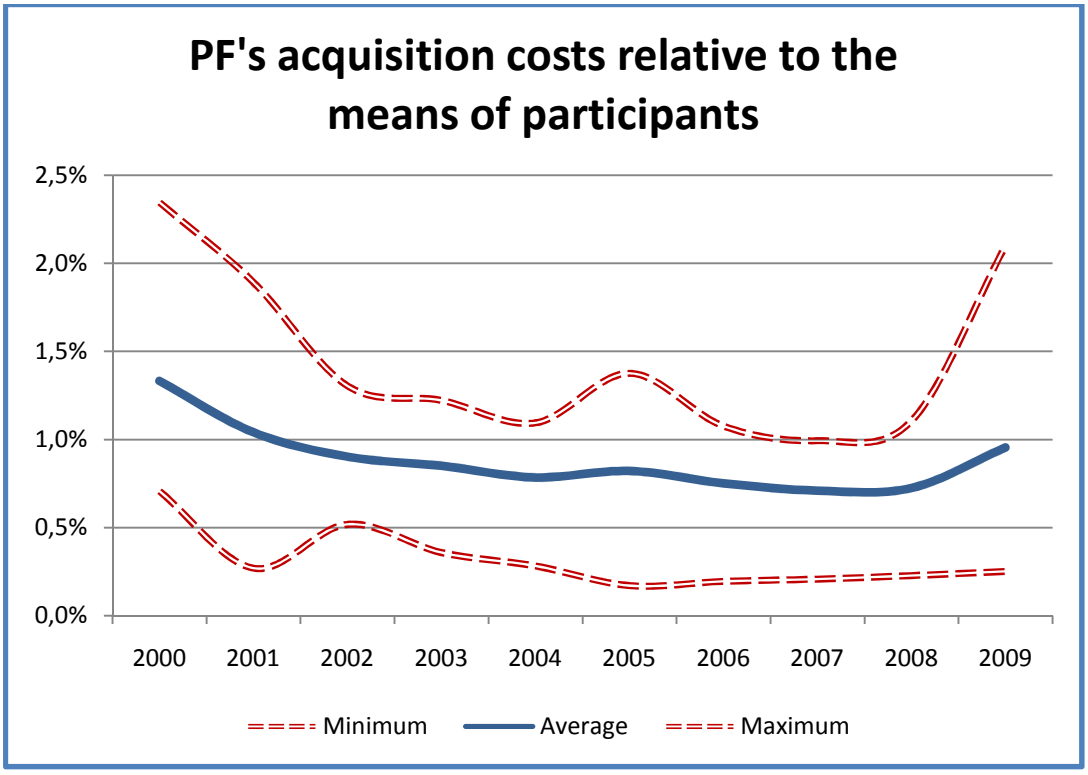
There are three main observation points resulting from Figure 7. First, downward sloping characteristic is observable at all three curves. This means that with growing competitive pressures all PFs were becoming relatively more efficient over the time. As the level of OPEX is reflected fully in income statements, the focus was to minimize the financial burden of every individual PF. Second observation is that the differences between the best and the worst performing PFs were decreasing steadily in time. In 2000 the difference between PF with the highest levels of OPEX (ČSOB Progres – 4.7%) and the lowest ones (ING PF – 1.6%) exceeded 3 percentage points. The same difference in 2009 did not exceed 0.4 percentage points, which is reflecting the successful effort of PFs with low operational efficiency to pair up with the best market practices. Finally, the average value of PFs relative levels of OPEX (excluding acquisition costs) did fall almost four times during the last decade, from 2.35 percent to 0.58 percent with continuous but decelerating declining trend. It is a

question to which level the PFs are able to suppress their OPEX, however it is reasonable to estimate that most of the cost-cutting potential has already been used.

2.3.4.2. Acquisition expenditures

Another important aspect of the cost efficiency analysis of the private pension scheme - the acquisition costs - is going to be analyzed. Due to the relatively stable number of net participants inflow into the scheme[17] one would expect the brokerage fee to be distributed relatively evenly over the observed period[18]. For the construction of Figure 8 the same data source as in case of OPEX costs analysis was used.

Figure 8: PFs acquisition costs relative to the means of participants



Source: author's calculation; data source: Annual reports of Czech pension funds 2000 – 2009

A number of findings reflecting the overall cost-effectiveness of PFs and the mutual relation of administrative and acquisition costs could be obtained from the Figure 8. First, in comparison with Figure 7 it is apparent that both cost elements expressed

[17] Over the period 1996-2009 the average net inflow of participants into the scheme reached 221 thousand, which is around 4,5% of total workforce.

[18] With stable share of participants scheme inflow one would expect the average share of acquisition costs (expressed as relative to means of participants) to fall steadily as there is a growth of AuM.

relatively to the participant means show similar dynamics. As well as the curve representing administrative expenditures, the shape of an average acquisition expenditures curve is also downwards sloped (omitting an upswing in 2009 which is going to be explained 2.3.4.3.). However, an average administrative cost curve is steeper. This signals that the relative costs cutting was more intense in the area of everyday operation of PFs rather than the in the way new clients are being acquired. This is an important observation. It reflects the state of market saturation as most potential members already participate in the scheme, and it is getting more expensive for agents to bring other clients into participation in the scheme.

2.3.4.3. Accrued costs

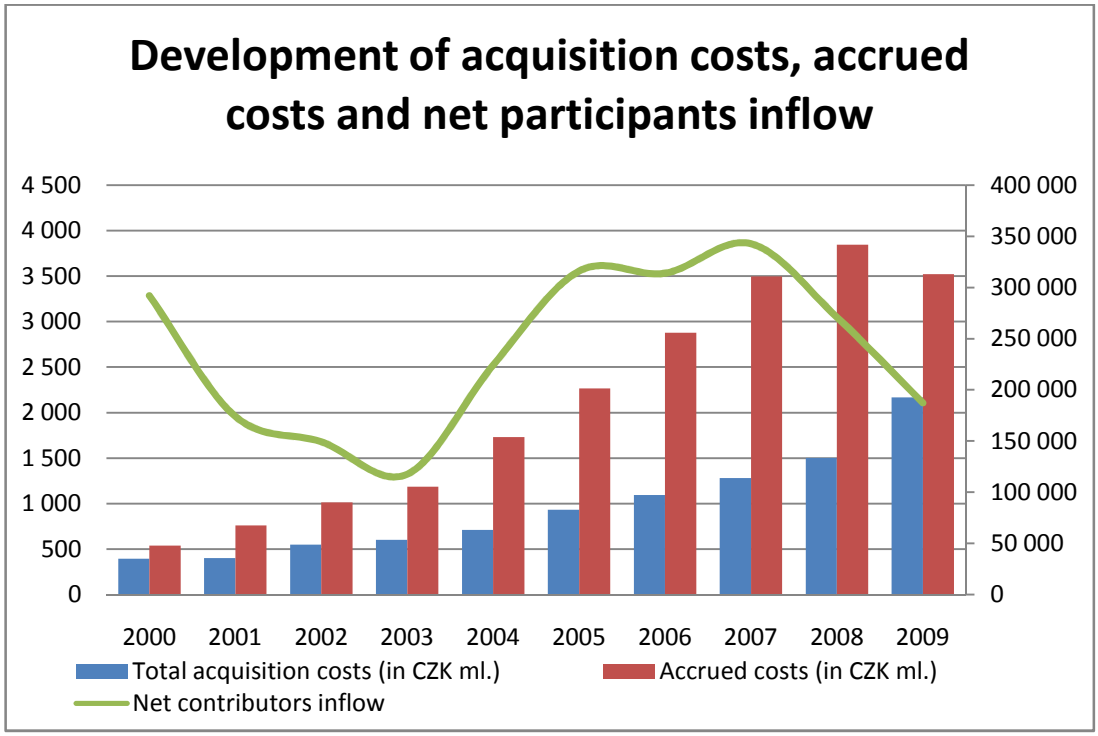
However, the cost analysis is not complete without reflecting on the specificity of the accounting rules according to which the acquisition costs are reported. There is a balance sheet item called accrued costs which reflect the acquisitions that happened in past but for which the PF has not paid yet[19]. Figure 9 is presented for better understanding of the last claim. It compares the absolute values of acquisition costs, accrued costs together with the net inflow of the participants. The data source is the same as in two previous cases.

One important conclusion that could be drawn from Figure 9 is that it confirms the above mentioned findings. Acquisition of clients is becoming more expensive in the nearly saturated market. To document this statement, over the period of 2007-2009 the acquisition costs per client were more than two times higher than in the period 2000-2002 neglecting the change in the accrued costs. Further, despite the rising absolute value of accrued costs in the PFs balance sheets over the last decade[20] (its value is depicted on the primary vertical axis), in relative terms the scheme experienced its stable decline. Both trends (higher acquisition cost per one contract and the lower accrued costs in relative and possible also absolute terms) are expected to last in the near future as a result of market situation.

[19] The remuneration of PFs agents for client's acquisition is annually added to the accrued costs item on the asset side of balance sheet. In the end of each accounting period the part of the total accrued costs[19] (according to the PF's internal accounting rules) is reflected into the profit and loss statement, and for this amount the total accrued costs is adjusted.

[20] The only exception is year 2009, when also the absolute value of accrued costs on year over year basis declined, which is also the explanation for the upswing of the curve of relative acquisition costs in 2009 documented in Figure 8.

Figure 9: Acquisition costs, accrued costs and the net inflow of scheme participants



Source: author's calculation; data source: Annual reports of Czech pension funds 2000 – 2009

Overall, the development of the cost position of Czech private pension scheme can be reflected positively. The initial high levels of relative operating expenditures were suppressed to the acceptable current levels. Several factors stand behind this shift: economies of scales, increasing intra-industrial competition and the effort of shareholders to protect PFs from any additional costs. Even though the current institutional setting does not impose any ceilings on the individual cost items (the rule of the prudent man), one can expect that the pressure resulting from the factors mentioned above will lead to the increased operational efficiencies in the everyday activities of PFs. On the other hand, the growing costs per new contracts combined with already high coverage may lead to the idea of imposing more strict regulation in the area of contract transfers in order to prevent the scheme from the redundant acquisition costs arising from pulling clients from one PF to another.

3. Comparison of the pension funds financial performance within chosen CEE countries

3.1. Motivation for pension funds financial performance evaluation

The phenomenon of population ageing, occurring in many developed countries across the world, resulted into the shift in traditional understanding of the role of state in the economics of pension. Throughout the last two decades, the growing number of claims on future pensions strengthened the fiscal pressures on many pension systems. These fiscal pressures placed an implicit demand to look for the current options that would lead to the diversification of funding sources of future pensions. This shift was augmented by the WB (1994) report, which came out with the recommendation to base the countries pension system on 3-pillars. The message was clear. Besides the recommendation to reduce the role of state PAYG system, it suggested to bring-in the diversification of pension system financing by introducing the mandatory (II. pillar) and the voluntary (III. pillar) pension pillars, where the future pensioners will gather their savings in the productive age so that the reduced state pension could be complemented from these sources.

This shift in understanding was accompanied by the gradual move towards diverse pension arrangements (either through individual accounts or collective schemes), where the future pension provisions are backed by the assets. This trend is visible in many countries around the world, where the new pension schemes have been established. The key outcome of the processes just described is the situation, in which a significant number of future pension claims are becoming asset-backed[21].

In this situation, a significant part of the future pension provisions are becoming directly dependent on the future discounted yields that are to be delivered by these assets. However, the increased linkage between the levels of future pensions and the performance of invested assets leads the participants into the situation when part of their retirement income will be subject to the market uncertainties connected with the investment process. Its potential consequences can be well documented on the recent

[21] Although, the current market situation in Hungary and potentially other countries signals that the option of nationalization of the accumulated assets accompanied by the return to the dominating role of the state PAYG pillar due cannot be excluded.

financial crisis. To back up the last statement with numbers, according to the estimates of Antolin and Stewart (2009), the financial losses of OECD PFs in 2008 topped up to $3.5 trillion or to about 20% of its total asset value in relative terms. Although OECD (2010) states that around $1.5 trillion have been already regained in 2009. But still, the investment losses experienced in 2008 have not been yet fully recovered by most of the OECD countries.

Besides the investment returns there are also other factors with direct impact on PFs ability to deliver adequate future pensions. These are the administration costs and investment management fees that need to be paid for scheme running or the legislative arrangements determining the retirement age. These factors also co-determine the levels of retirement pensions. Thus, the examination of asset-backed pension schemes based ultimately on the investment returns would be wrong, as the asset returns are only one of the factors (though important) determining the ability of the system to deliver adequate retirement income.

Over the last two decades, a vast amount of recent academic debate and research already focused on these other factors as the determinants of future pensions in funded schemes. As a result of this debate, some of the research findings have already been reflected in the political actions in recent years. Since then, many countries introduced various mechanisms to decrease the cost burden. Among others, the imposition of ceiling limits on administrative costs or investment management costs (CEE countries), or the introduction of "blind trust" accounts (Sweden) and bringing in the lottery mechanisms that "distribute" new participants among existing PFs (Poland) could be picked out as the examples of successful effort to bring research findings into the political actions.

On the other hand, the area of financial performance of pension funds has not been examined extensively yet for various reasons. One of the reasons may be an implicit reliance on the competitive model that it will provide the optimal asset allocation. In this model the PF managers will compete for funds, and the individuals will place their assets into the funds based on their risk preferences, which will lead to the desired outcome – an optimal asset allocation. However, as Rudolph (2010) points out, this model builds on the premises that the contributors have the ability to identify the factors determining the adequate levels of retirement income, compare

these factors with the investment performance of available PFs, and choose the outcomes which optimize their retirement income with respect to their individual preferences. This line of reasoning, however, does not reflect the limitations an average contributor faces.

Often, the market does not provide simple information based on which individuals are able to make their decisions. Furthermore, even if such information is publicly available, due to its complexity it may not be understandable for an average contributor, which may lead to the suboptimal investment decisions (see e.g. Lusardi and Mitchell, 2006 or Clark et al., 2010).

On the top of that, the evidence from decision-making theory points out on the presence of an excessive risk aversion or a decision avoidance. As Campbell (2006) or Benartzi and Thaler (2007) point out, under such conditions, people rely on simple heuristics being reflected in the choices of naïve investment strategies (I will invest either into bonds or equity), mental accounting treating differently their "old money" (the already invested amounts) and "new money" (amounts not yet contributed) or through the peer effects (I will invest similarly as my spouse, friend, colleague etc.). Many individuals simply lack the formal investment training, which often leads to the sub-optimal portfolio allocation choices.

Some governments, with the intention to prevent contributors from any loss-making decision, imposed certain regulatory restrictions, typically a sort of minimum return guarantees. This brings another aspect, which may distort market from the optimal asset-allocation. The studies of Basak and Makarov (2008) and Castaneda and Rudolph (2009) demonstrate that the presence of minimum return guarantees may lead to the market situation with multiple equilibria or no equilibrium at all. Under such arrangements the asset returns may be partially protected, however, at the cost lowering potential portfolio yields as the managers prefer more conservative risk-return portfolio allocations. Again, this process may end up with the sub-optimal portfolio allocations.

After taking into consideration the findings presented above, the evaluation of financial performance of respective pension schemes based on the comprehensive methods is needed. Through comparison of financial performance of various pension schemes, the best case practices can be identified, and better understanding of typical

drivers of successful performance could be achieved. Based on the findings of such research, important policy recommendations could be drawn. Therefore, the following section will be focused on the methodological issues of PFs performance evaluation, so that it could be used for an empirical study focused on the comparison of the Czech private pension scheme with other neighboring countries.

3.2. Evaluation of financial performance of private pension funds

The development of performance measurement framework specific to the pension funds industry is a relatively new topic in the academic literature (see e.g. Rudolph, 2010). In fact, the impulse for the development of industrial specific evaluation framework tracks back to Campbell and Viceira (2002). In their work they emphasized the objective of the pension industry that is to ensure an adequate retirement income to future pensioners, and which is thus naturally different from the other forms of collective investment that are primarily concerned with the short-term asset maximization. Different objectives then define a different timeframe over which the performance should be tracked, and which are also associated with the different levels of risk tolerance. Their work started to change the way researchers think about the portfolio and investment characteristics of pensions. Since then, a vast amount of academic research has been targeted to the development of optimal asset-allocation strategies incorporating fundamentals of life-cycle savings and management of risk.

Despite the different objectives of pension industry and other forms of collective investment, the typical approaches used to measure the PFs performance have been so far mostly identical to the ones applied to other types of investment opportunities. Possibly, due to the relatively short time period for the implementation of new theoretical findings, most of the empirical research in the area of evaluation of pension funds performance mostly focused on the aspect whether the scheme delivered a reasonable rate of return over some observation period. Naturally, this approach does not necessarily represent the above mentioned objectives of the funded pension schemes. This means that to compare the monthly or annual returns may not be totally meaningful, unless measured against a specific (set of) benchmark(s) that comply with the above mentioned objectives.

So far, the most comprehensive published study, which focused on the comparison of pension funds industry financial performance, comes from the joint research program of OECD and WB[22]. In connection with three private sector entities[23], this research program gathered all available information concerning the financial performance of pension fund industries. As a core part of the output, the program delivered the initial assessment of PFs financial performance of OECD countries. Also some non-member countries with reformed pension systems were included in the report. In total, 23 countries entered into the analysis, and these were the countries for which the basic historical data were available, inclusive of the mix of occupational and personal schemes as well as defined-benefit (DB) and defined-contribution (DC) systems.

In my thesis, I will take the advantage of the built-up methodological background delivered by the research program as presented in Walker and Iglesias (2007), Antolin (2008), Tapia (2008) and some other relevant academic sources that can be used for comparison of the financial performance of Czech private pension scheme with other reformed private pension schemes within the CEE region. The results may help us to understand whether the assets invested into the Czech private pension scheme were able to deliver adequate returns in comparison with chosen benchmark instruments, and also, in comparison with other pension schemes within the region, even though we are aware of intrinsic differences across different pension schemes.

3.3. Methodology

In the following passage the methodological approaches used for the analysis measuring the risk-adjusted financial performance of private pension schemes will be presented. Methodology then will be applied to the data for countries that have been selected for the purpose of financial performance comparison of the Czech system with other CEE countries. Walker and Iglesias (2007) provide a good summary of alternative methodologies generally used for the evaluation of financial performance of pension industries. However, most of the alternative methodologies require more detailed data (in terms of frequency of portfolio returns or stratification of PFs

[22] The results of the research program were summarized in the final report*: Evaluating the Financial Performance of Pension Funds*, edited by Richard Hinz, Heinz P. Rudolph, Pablo Antolin, and Juna Yermo. The World Bank, 2010.

[23] These entities are two world-wide pension providers: Spanish based BBVA, and Dutch based ING Group. Third entity employed in the research program was the Dutch Association of Industry-Wide pension Funds (VB).

portfolio including separation of local/foreign bonds and stocks in time) than the observed schemes could deliver. Thus, the chosen methodology reflects a reasonable trade-off the level of input data detail and the information that could be obtained from these data.

Two different approaches to measure PFs financial performance will be used in this work. First, the discussion covers a term "Sharpe ratio", the most widely used risk-adjusted financial performance measure. Its advantages and potential usage limitations will be presented. Further, a complementary performance measurement called Sharpe Style analysis (or empirical attribution analysis) will be described.

3.3.1. Sharpe ratio

Generally speaking, the objective of most of the measures used to evaluate portfolio performance is to assess whether the managers were able to bring any additional value compared with alternative investment strategies. These are usually represented by accessible and typically well-diversified benchmarks. Thus, when analyzing the aggregate PFs (scheme) returns of the individual country, the basic research question is whether, after reflecting on the different investment limits (typically set by the regulator) and active managerial portfolio decisions, the scheme has been able to deliver any welfare premium with respect to feasible alternative (usually passive) investment strategies. Thus, in order to come up with such an assessment the returns of the schemes need to be compared with a reasonable benchmark(s).

One of the most typical measures in the modern portfolio theory remains the "Sharpe ratio" (SR)[24]. Sharpe (1966) came out with the measurement used to rank the performance of mutual funds. If the investors combine a single risk-free asset with the portfolio whose performance is to be evaluated, then, under the condition of the same risk position (volatility), the SR is the measure according to which the portfolio could be ranked. It is a measure of the excess (differential) return per unit of risk. The condition of the same perception of risk is essential in this case.

The idea of SR is based on the prospects of the Markowitz (1952) mean-variance portfolio theory. There, it is assumed that the individual characteristics of portfolio

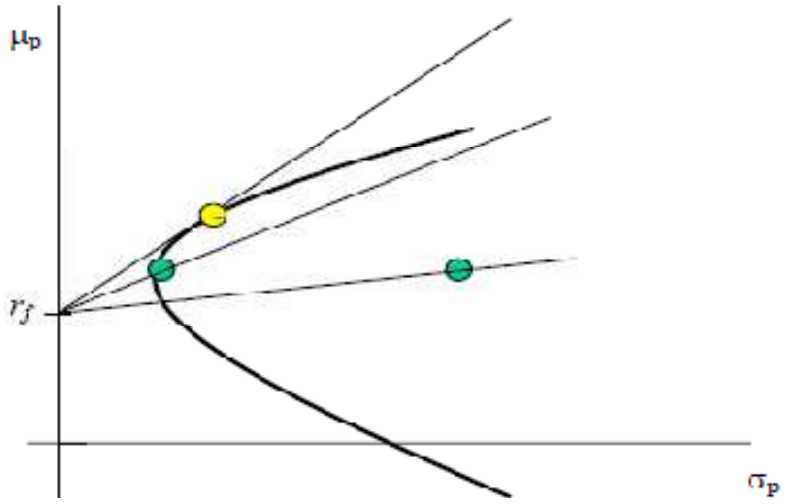
[24] Sharpe ratio was originally introduced as "reward-to-variability ratio". While used frequently, the terminology has not been consistent until 1994 when Sharpe came up with its unification. Prior to that some (e.g. Radcliff (1990); Haugen (1993)) called SR the "Sharpe Index", others used a term Sharpe Measure (e.g. Reilly (1999); Elton and Gruber (1991); Bodie, Kane and Marcus (1993)).

(mean return and standard deviation) are sufficient statistics to evaluate individual investment portfolio. Thus, only first two moments of a distribution enter into the analysis when SR is used to evaluate the investment portfolio. It is very likely that most of the variability of portfolio performance we analyze - aggregate financial performance of pension schemes over the 10-year period - will be captured by its return mean and standard deviation.

Sharpe (1994) reminds that there are two types of the SR ratio: ex ante and ex post SR. In most cases, the performance measures are computed using historic data, and while ex post SRs are used for empirical observations, the ex ante values are mostly only a subject of theoretical discussions. However, it is assumed that (either explicitly or implicitly) that the historic values have at least some predictive power. For the objective of pension schemes financial performance comparison the ex post SR ratios will be used.

As Walker and Iglesias (2007) state, the portfolio with the highest SR shall be preferred among investors if (at least) the following conditions hold: 1) The same planning horizon is shared by all investors; 2) consumption goods prices are uncorrelated with asset returns; 3) there are no other sources of wealth; 4) no short-sale restrictions for the risk-free asset take place. If these conditions hold, the SR is monotonically increasing transformation of welfare. The highest SR value is then the one, which maximizes the expected return per unit of risk.

Figure 10: The Sharpe Ratio



Source: Antolin (2008)

Figure 10 graphically represents the Sharpe ratio. On the horizontal axis the standard deviation of portfolio returns is depicted. Vertical axis captures the portfolio returns. The SR of observed schemes is then represented by the slope of the line linking the risk-free alternative with the ratio of portfolio *excess (differential) returns* with respect to the *standard deviation* of this portfolio. If the above mentioned assumptions hold, then the most desired option for shareholders will be the portfolio with highest SR, which is with line with the steepest slope in the Figure 10.
Numerically, the SR could be presented as follows:

Let R_t be the return on the portfolio reached between dates t – 1 and t, R_{Ft} be the return on the benchmark (risk-free alternative) portfolio reached in the same period and denote by μ and σ its return and variance:

(1) $\mu \equiv E(R_t)$

and

(2) $\sigma^2 \equiv var\ (R_t)$

Then the Sharp ratio (SR) is defined as the ratio of difference between return of portfolio and the risk-free alternative with respect to standard deviation of the observed difference:

(3) SR $\equiv \frac{\mu - R_F}{\sigma}$

Universally, SR in this form represents the ratio of historical average excess return per unit of historic excess return variability. As μ and σ are unobservable they must be computed by using the historical data. Having a sample of historical returns $(R_1, R_2, \dots, R_n)$ the estimators are the mean and variance of this sample:

(4) $\hat{\mu} = \frac{1}{T} \sum_{t=1}^{T} R_t$

(5) $\hat{\sigma}^2 = \frac{1}{T} \sum_{t=1}^{T} (R_t - \hat{\mu})^2$

Then the estimator of the Sharpe ratio ($\widehat{SR}$) is defined as follows:

(4) $(\widehat{SR}) = \frac{\hat{\mu} - R_F}{\hat{\sigma}}$

Furthermore, under the assumption that the returns are independently and identically distributed (IID), Lo (2002) develops a methodology for evaluating a reliability of estimation of SR. Under the IID assumption of portfolio returns, Lo (2002) shows the standard error for estimator of Sharpe ratio $\widehat{SR}$ can be expressed as indicated in equation (5):

$$(5)\ SE(\widehat{SR}) = \sqrt{\left(1 + \frac{1}{2}SR^2\right)/T}$$

Following another step of Lo (2002), by substituting $\widehat{SR}$ for SR the standard error might be computed. The 95-percent confidence interval for SR to appear around the estimator $(\widehat{SR})$ is then settled as follows:

$$(6)\ (\widehat{SR}) \pm 1{,}96\sqrt{\left(1 + \frac{1}{2}\left(\widehat{SR}\right)^2\right)/T}$$

Both findings presented in equation (5) and (6) will be used in this work for the purpose of empirical comparative analysis, as the estimated results will be observed whether they are significantly different from zero. Moreover, as Lo (2002) suggests, similar results will be obtained even if the IID assumption does not hold, as long as the stationarity assumption of the historical returns is not violated.

Benchmarks used for SR computations:

The choice of benchmark that would fulfill the requirement of risk-free marketable security, and that would also reflect the industrial objectives, needs to be considered carefully. A couple of considerations arise.

First limitation may be an absence of the truly "risk-free" alternative in the market of country analyzed. This could be worked out by the choice of low-risk alternative. Also, adjusting portfolios for domestic inflation and keeping it denominated in the local currency helps to mitigate this potential limitation. Second, proper investment horizon needs to be taken into account. In case of pensions the investment horizon should be considered long-term. Thus, the low-risk benchmark asset used for SR computation should reflect long-term horizon (e.g. 10 or 20 years), however if marked to market it would show a considerable volatility, therefore it would not be convenient for the SR computation. Under the assumption that excess returns are uncorrelated over the time, one can use e.g. monthly (quarterly) returns of long-term

bonds instead. Another issue arising is the usage of non-domestic currency benchmark as a "risk-free" asset. Besides potentially low absolute default probabilities of respective benchmark asset, there is a country currency risk entering into the consideration. However, for more diverse information to be obtained from the comparative analysis also foreign-based benchmark assets denominated[25] into the domestic currency will be utilized in our computations.

In the aforementioned OECD WB (2010) research project, four alternative low-risk benchmark assets were chosen for computation of SRs. The returns on the following assets were used as a low-risk benchmarks: return on local 3-month Treasury bills (local T-bill), 10-year local government bond (local T-bond), and 3-month U.S. Treasury bill (U.S. T-bill) together with 10-year U.S. Treasury bonds (U.S. T-bond), both denominated into the local currency.

Each of these low-risk benchmark assets was used for a different purpose so that the provided financial performance evaluation of respective pension schemes would offer more complex information. For the purpose of comparison of financial performance of Czech private pension scheme with other CEE reformed countries, similar benchmarks will be used. In order to adjust for the regional differences, the German bonds (with the lowest European default probabilities) instead of U.S. bonds will be used. To summarize, the following four benchmarks will be used for this objective.

1) Returns on the local 3-month Treasury bills (local T-bill) - STL
2) Returns on the local 10-year government bonds (local bond) - LTL
3) Returns on the German 3-month Treasury bills (GER T-bill) - STG
4) Returns on the German 10-year government bonds (GER bond) - LTG

Applied to these benchmarks the SRs may provide a meaningful answer to the question, whether the portfolio managers in respective pension schemes have been

[25] The annualized yields of the foreign based risk-free assets are denominated into the local currencies. The foreign exchange rates fluctuations are fully accounted for as the changes in the historical exchange rates are reflected in each observation of the risk-free returns. Thus, the differences between portfolio returns and foreign based risk-free benchmark returns are influenced by the FX rate development. In our case the real long-term appreciation of CEE currencies (increasing the denominated excess returns) may potentially lead to the higher SR levels. On the other hand, the fluctuations in the FX development also increase the volatility of excess returns having the opposite effect on the SR levels.

able to deliver the risk premium over the returns of the chosen country-specific and international low-risk reference benchmarks.

Limitations of the SRs comparability:

There are certain limitations for SR interpretation that need to be kept in mind. Based on the macroeconomic development the SR is expected to vary over the time periods and across asset classes. Therefore, to compare pension funds (schemes) that invest into the different asset classes or over the unmatched time frame may not be always meaningful (see e.g. Walker and Iglesias (2007)).

Furthermore, in some cases the SRs values do not necessary correspond with its original usage intention: to reward excess returns and penalize for increased risk. This is documented by Harding (2002). The standard deviation used in the denominator of SR reflects on the distance of each return (positive or negative) from the mean return. This approach neglects the difference in risk perception between large positive and negative returns, not negligible in e.g. dynamic investment strategies. In fact, if there is an outstanding excess return in one period, its removal from the sample may paradoxically lead to an increase of SR, as if it remained involved in the sample, the increase in the mean return would be out weighted by an increase in the returns volatility.

The limitations are even stronger when attempting to compare the SR values across countries. Besides the above mentioned problems there are also other factors that hinder such a comparison. First, it is not always the same investor facing the problem of portfolio allocation. With different perception of welfare also comes the different perception of risk (one can assume that countries with lower welfare would be less risk-averse), which aggravates the SR comparison. Further, as described already above, the currency risk together with interest rate risk are country specific measures. Final consideration comes in the case of absence of risk-free country specific asset benchmark. The low-risk alternatives may not be always associated with similar levels of risk. Again, the same (or very close) perception of risk is essential condition so that we may compare its different levels across countries. Therefore, for any comparative purposes it is necessary to keep these potential flaws in mind when interpreting the SRs.

3.3.2. Sharpe Style analysis:

The complementary methodology in the form of Sharpe Style (or empirical attribution) analysis will be provided in this work. This methodology comes from Sharpe (1992), and since then became a widely used tool to evaluate portfolio managers' decisions (also used in Walker and Iglesias (2007)). This aim of this analysis is to find out whether these decisions delivered any wealth increase value through by active securities selection or market timing (or both) in comparison with passive investment strategy. It allows the usage of several benchmark securities or market indices. With relatively low demand on data (only PFs and benchmark returns), the Sharpe style analysis is an effective tool to determine the effects of investment asset allocation *(style)* and of active portfolio management decisions *(selection)* on the overall portfolio returns.

Basically, there are three steps when performing the Sharpe style analysis. First is to choose the appropriate asset classes (benchmarks) that will enter into the analysis. Second step is to estimate the sensitivities of returns on individual asset classes to the changes in PF/scheme returns (portfolio style). The final step is to compare the returns of portfolio (constructed from the asset weights estimates from the second step) with the actual portfolio returns. From this comparison we determine the quality of active portfolio management.

Numerically the Sharpe style analysis can be expressed as indicated below. This analysis presented in Sharpe (1992) is a specific form of the asset class factor model, which is often used for the analysis of investment behavior. Generally speaking, the return on the respective asset(s) (in our case the aggregate scheme return) is directly influenced by a number of factors (the returns on the set of chosen benchmarks). The purpose of this analysis is to settle the impact of individual factor returns on the observed scheme returns. In the generic form the asset class factor model can be expressed as follows:

Asset class factor model:

(7) $R_i = [b_{i1}f_1 + b_{i2}f_2 + \cdots + b_{in}f_n] + e_i$

Here, the R_i stands for the return on asset *i*. The values of the factors 1 through n are represented by $f_1 \ldots f_n$ while e_i stands for the non-factor component of the return (the

remaining part of the i-th asset return remaining unexplained by the factors $f_1 \dots f_n$). The sensitivities of these factors to various levels of R_i are represented by the values of b_{i1} through b_{in}.

In the asset class factor model where each of the factor represents a return on one of benchmark asset classes (a special case of equation 7), and where the sensitivity values (b_{ij}) sum up to 1 (100%), the return on portfolio *i* can be divided into two components. The sum of the values in the brackets in equation (7) represents a part of the portfolio return attributed to its *style* (return stemming from the estimated portfolio composition), and the residual return (e_i) in the same equation stands for the portfolio *selection* (return/loss resulting from the active choice of instruments within the estimated portfolio composition).

The key assumption here is that the non-factor return component for asset *i* (e_i) is uncorrelated with all other assets non-factors (for example e_j). In other words, if this assumption is valid, then the only source of correlation among returns comes from these factors. Thus, if valid, it allows us to separate the *style* and *selection* portfolio returns.

The purpose of the Style analysis is to use a set of known indices for a portfolio benchmark construction, against which the actively managed portfolio will be compared with (Sharpe, 1992; Jackson and Stauton, 2001). As Lobosco (1999) states, one of the key advantages of this method is that it requires only PF returns as input data, thus only a several years of monthly or quarterly return data are sufficient for the use of this analysis.

The ability of the model to fit the data at hand could be measured by the proportion of portfolio return variance that is being "explained" by the selected asset classes. In this case the R-squared presented in equation (8) decreases with the amount of variance "unexplained" by the chosen number of asset classes.

(8) $R^2 = 1 - \frac{Var\,(\hat{\tilde{e}}_i)}{Var\,(\hat{\tilde{R}}_i)}$

Technically we can set a procedure for estimation of the historical exposures to these asset classes through the comparison of realized scheme returns with benchmark returns from equation (7). By rearranging equation (7) we can get equation (9). Its

left hand side can be interpreted as the return difference between the returns of fund/scheme and the passive portfolio of the same style (both composed from the estimated portfolio weights). The goal of the Style analysis is to come up with the style that would minimize the variance of the aforementioned difference. This will be done through a standard regression analysis.

(9) $e_i = R_i - [b_{i1}f_1 + b_{i2}f_2 + \cdots + b_{in}f_n]$

In such regression, the realized returns will be dependent variable and the returns on chosen asset classes will be used as independent variables. When assuming a relationship between portfolio returns and returns on selected market indices, these are the factor sensitivity coefficients that determine to which extent the returns of the PFs portfolio are affected by the returns on selected market indices.

However, through traditional regression, coefficients may take on either negative or positive values. In order to come up with the historical asset class exposure estimates consistent with the investment positions of the PFs, two adjustments need to be made. First, as Karacabey and Gokgoz (2006) point out, for investment practitioners it is usually unappealing for chosen market indices to have a negative impact on the subject portfolio returns. Thus, the adjustment reflecting the non-negativity of factors will be implemented. Secondly, after setting the share of style returns with respect to total PF/scheme returns, by the replication of returns into the sensitivity of chosen benchmark asset classes, the sum of the b_{i1} to b_{in} coefficients is going to be 1 (or 100%) so that the investment style of the fund could be projected fully. Although such an adjustment might lead to slight reduction of the R-squared presented in equation (8), the obtained estimates will be consistent with the investment behavior of PFs.

Reflecting on the constraint in the form of non-negative portfolio weights the regression will be solved by the technique called “Quadratic Programming”. For more to find out about this technique see e.g. Jackson and Stauton (2002). This technique will provide us with the estimates of weights used for composition of the Sharpe style index. Through the comparison of index return with actual PF/scheme returns, the extent and quality of active portfolio management can be estimated.

Applying the methodology into the context of evaluation of pension schemes financial performance, the analysis will employ a typical set of asset classes. Again, there will be only the regional adjustments when compared to the classes used in Walker and Iglesias (2007). Thus, the asset classes entering into Sharpe style analysis are:

1) r_{db3M} = Returns on the local 3-month Treasury bills (local T-bill)
2) r_{db10Y} = Returns on the local 10-year government bonds (local bond)
3) r_{Eloc} = Returns of the local equity index (local equity)
4) r_{Gb3M} = Returns on the German 3-month Treasury bills (GER T-bill)
5) r_{Gb10Y} = Returns on the German 10-year government bonds (GER bond)
6) r_{Eglob} = Returns of the global equity index (global equity)

Thus, by adjusting equation (9) to e.g. Czech conditions, we get the following equation:

(10) $\overline{e_{CZ}} = \overline{R_{CZ}} - [\overline{b_{CZ1}} r_{db3M} + \overline{b_{CZ2}} r_{db10Y} + \cdots + \overline{b_{CZ6}} r_{Eglob}]$

By applying accessible data on equation (10), and following the non-negativity constraint on b_{CZi} coefficients, we will get the estimation of investment *style* (its exposure to these six asset classes) of the Czech voluntary private pension scheme together with the share of the style returns on the total scheme returns. Then by the comparison of actual PFs returns with the benchmark (style) portfolio, the ability of the Czech PF managers to add value could be evaluated (selection).

3.4. Analyzed countries

The goal of this work is to come up with the comparison of the financial performance of the Czech private pension scheme with other relevant private pension schemes within the Central-Eastern Europe (CEE) region with the ambition to answer the question whether the Czech scheme delivered any premium with respect to the chosen low-risk reference benchmarks, and how it stands internationally. The choice of the countries for such comparison was conditioned by the presence of the reformed private pension scheme of an adequate size which can offer at least 5-year track record, and for which also the data were accessible.

In total there are 6 countries entering into the analysis. These are: the Czech Republic, Bulgaria, Croatia, Hungary, Poland and the Slovak Republic. Despite of sharing some similar features each of these pension schemes has its unique characteristics that need to be kept in mind when the results will be interpreted. The basic characteristics of the private pension schemes in respective countries that enter into the analysis are summarized in Table 4:

Table 4: Characteristics of the private pension schemes in the chosen countries

Country	Year of reform	Mandatory		Voluntary	
		Occupational	Personal	Occupational	Personal
Bulgaria	2002	√	√		√
Croatia	2002		√		√*
Czech Rep.	1994				√
Hungary	1998		√	√*	√*
Poland	1999		√	√*	√*
Slovak Rep.	2005		√		√*

Source: *Author*

Notes: √ = this scheme enters into the analysis; √*= will not be analyzed

In the following section, each of these private pension schemes will be shortly introduced.

3.4.1. Bulgaria

Over last decade the Bulgarian pension system went through a significant process of development. The reform effort began in 1995 when Bulgaria implemented its voluntary private pension system. Later, after the parametric adjustment of state PAYG system in 2000, the mandatory occupational private pension pillar covering all employees was introduced in 2002. In 2007 Bulgaria finalized its reform efforts by introduction of the "fourth pillar" in the form of voluntary occupational private pension scheme. Further changes, such as gradual increase of contribution period required for full pension entitlement or introduction of the pension bonus system for persons that would remain professionally active after reaching full pension eligibility, are going to be introduced in 2011. Such development has been driven by solemn demographic predictions as for example the European Commission (2010) in its demographic outlook predicts that Bulgarian population will shrink from 7.6 to 5.3 million by 2060. Such a shrink stands for the highest relative population decrease out of all EU countries.

Second Pillar:

Currently, there are two types of the PFs operating within a mandatory pension pillar in Bulgaria. These are the universal (UPF) and occupational (OPF) pension funds. The participation in either of the schemes is mandatory. All public and private sector employees and self-employed persons born in 1960 or later become automatically members of the UPF scheme. Moreover, all employees (regardless of their age) that work in hazardous occupations based on the governmental classification also become the members of OPFs. UPF contribution rate is 5 percent of the employee's gross wage, and the contribution is divided between an employer (3 percent) and an employee (2 percent). In case of the self-employed individuals, the contribution is entirely covered by these individuals. UPF scheme is a fully funded defined-contribution scheme where the individual accounts are held. Also, there is an upper limit for contributions set at the level of 1,400 BGL. The additional contributions into the scheme are not allowed. The contributions into the scheme are tax free.

The OPFs are covering the employees working in hazardous jobs, and their purpose is to provide the participant with an option of an early retirement. By contrast to UPF, the level of contribution that employers pay for their employees depends on the

job category, and ranges from 7 to 12 percent of employee's gross wage. OPF is also the fully funded and defined contribution scheme. The additional scheme contributions from the employees are allowed.

There are some investment restrictions for both OPFs and UPFs. The joint exposure to equity and mutual funds is limited to 35 percent (20 and 15 percent respectively). Also only the maximum of 15 percent of total assets can be invested into the foreign markets. The property investment or any investment into single company securities cannot exceed the limit of 5 percent. Also, the minimum guarantee reflecting the returns of last 24 months needs to be achieved by any OPF or UPF fund any time, and the level of this guarantee is quarterly announced by the regulator. In the case fund achieves a return lower than the required minimum, additional capital needs to be added to the reserve fund.

The contributions into the system are exempt from taxes. In the pay-out phase, the benefits linked to the second pillar are being distributed in the form of life-long annuity. Its amount is derived from the gathered means in the personal account. By the end of 2009 the Bulgarian UPFs and OPFs managed the assets amounting to BGL 2 629 mil. (€ 1 341 mil.[26]), which was about 4 percent of country's GDP.

The asset mix of Bulgarian second pillar pension funds in 2009 was formed by the debt securities (45 percent), about 28 percent were held in the form of cash and deposits, and the exposition to the equity exceeded 11 percent. The investment into the mutual funds reached similar levels, and other forms of investment did not exceed 5 percent. Over the period 2004 - 2009, the mandatory pension scheme delivered by average a nominal return in the amount of 4.5 percent for UPF scheme and 3.9 percent in the case of OPFs (reflecting the real scheme returns of -0.6 and -1.3 respectively).

Third pillar:

In the mid-1990s, Bulgaria (together with the Czech Republic and Hungary) was one of the first within CEE region that introduced a voluntary private pension scheme (VPFs). It is a fully-funded defined contribution scheme based on the individual

[26] BGL/EUR = 0.51140 exchange rate was obtained from European Central Bank (ECB): http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html. The information about the Bulgarian GDP was obtained from EUROSTAT.

accounts. By 2009, there were 557 thousand of VPF participants, and the scheme gathered the means amounting to BGL 525 mil. (€ 269 mil.), which represents 0.8 of Bulgarian GDP. In total there are 9 pension funds operating in the market. The investment regulation is similar as in the case of second pillar, however more lax.

The contributions are exempt from personal income tax up to the amount of 10 percent of dispensable income. All the citizens over 16 are allowed to participate in the scheme. There are three options for the benefit pay-out phase: lump-sum settlement, periodic payments or phased withdrawals. The asset allocation is very similar to the second pillar funds only the mutual funds exposition is up to 16 percent, and bonds exposition is down to 40 percent. The scheme yields since 2004 are also similar, due to the immense loses experienced in the period of financial crisis in 2008-2009 an average real return reached negative 0.9 percent.

3.4.2. Croatia

The systematic pension reform in Croatia was introduced gradually. However, the circumstances behind the reform were even more dramatic than in other CEE countries. Besides the challenges resulting from the deep structural changes due to its economic transformation, Croatia also suffered heavily from the damaging consequences of the war in the former Yugoslavia. This, besides the human and economic losses, led to the decrease in the size of total workforce, and also to a sudden increase in the total number of pensioners. In the light of these events and circumstances, Croatia adopted a complete pension reform relatively swiftly. The necessary parametric reforms of PAYG system dating back to 1999 had come first, and the reform was completed in 2002 by the introduction of mandatory personal and voluntary personal schemes.

Second Pillar

The mandatory pension scheme based on the defined contribution system linked with the individual accounts was introduced in Croatia by 2002. The system participation was mandatory for people below 40, those above 40 and below 50 could choose whether to enter into the new system or rather stay in the first pillar PAYG system. Those above 50 were excluded from the participation. The contribution rate is 5 percent, and is paid ultimately by an employee. The individual accounts are

administered by pension fund management companies (PFMP), and the means of participants are invested through the fund (a vehicle to invest participant assets) created by the PFMP. There is a legal restriction which does not allow setting up more than one PF per each PFMP.

As in other CEE mandatory pension schemes, also Croatia places the quantitative investment limits on holdings of different asset categories. Croatian particularity is the requirement that the minimum of 50 percent of total assets needs to be invested into the Croatian government bonds. The equity exposure cannot exceed 30 percent, as well as the exposure to domestic corporate bonds or open investment funds. The aggregate foreign investments cannot exceed 15 percent in the case of bonds issued by the OECD countries, for corporate bonds and shares it is limited to 10 percent.

There is also the minimum return guarantee for individual accounts. If the returns of any fund fall below the reference rate defined as weighted average of all PFs returns over the last three years minus two percentage points, the individual PF needs to top up the returns to this reference rate. The capital will be taken from the reserve fund, which was created from the fixed success fee contributions from previous periods. If the amount of capital in reserve fund is not sufficient to cover the required amount, the PFMP needs to add the capital from its own sources, and if the PFMP is not able to fulfill its obligations the Croatian government will fill in the remaining part.

In the pay-out phase, the gathered capital needs to be invested into the life-time annuity offered by the certified pension insurance company, which are to be indexed to inflation. The contributions and the capital gains are tax-exempted, and the benefits are subject to the future taxation (EET type). Currently, there are 4 active mandatory pension funds that manage the assets of HRK 29.2 bn. (€ 4 bn.), which stands for 1.7 percent of Croatian GDP[27]. Concerning the asset allocation as of 2009 the exposure to government bonds exceeded 61 percent, the scheme held around 16 percent in equity, the money market instruments stood for 12 percent, and mutual funds exposure topped up at 7 percent. The exposures to other investment vehicles did not exceed 4 percent. Over the period 2002-2010 the scheme managed to deliver

[27] HRK/EUR = 0.1374 exchange rate was obtained from ECB: http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html, and the information about Croatian GDP was obtained from EUROSTAT.

nominal investment returns amounting to 5.6 percent, 2.8 percent expressed in the real terms.

Third Pillar

Introduced in 2002, the defined contribution scheme based on the voluntary pension savings accounts completes the three-pillar pension system. The offer is not restricted to the pension funds only. Trade unions or employers may also set up a closed pension fund. However, for any plan to operate in the market a total number of its participants needs to exceed 2000 after two years of operation. The participation in the scheme is motivated by generous monthly tax deductions (up to HRK 1050 monthly – an equivalent of € 140), and also by the annual state subsidy (up to HRK 1250 – approx. € 169). However, the employer payments are not exempt from taxation. By the end of 2009 there were 6 active voluntary pension funds offered by 4 pension companies and also 15 closed voluntary funds. The investment regulation of voluntary pension funds is similar to the second pillar pension funds but slightly more liberal. E.g. the limit for international investment exposure is set to 20 percent rather than 15 percent in case of the mandatory funds. Benefits are paid in the form of annuities or periodic payments. In general, the government bonds exposure is lower than in mandatory pension scheme, as in 2009 it stood for 53 percent of total assets, the corporate bonds and mutual funds exposure stood both for 12 percent, the equity exposure reached 15 percent, and 6 percent of the assets were held in deposits. The rest (around 2 percent) was placed in other investments instruments.

3.4.3. Hungary

Hungary was the first country that introduced a complete pension reform out of the countries observed. By 1998, Hungary already reformed its PAYG system substantially (prolonging the retirement age, and introducing an increased linkage between contributions and benefits), and managed to introduce the mandatory and the voluntary pension schemes. Reflecting on the World Bank recommendations, Hungary could be labeled as a “role-model” for other CEE countries for pension reform introduction. Unfortunately, the recent steps of Hungarian government will lead to taking away this label from Hungary.

The Hungarian mandatory second pillar currently faces a serious existential threat, as in October 2010 the government (holding a constitutional parliamentary majority) introduced its plan to switch (to nationalize) the assets accumulated in the mandatory pension scheme back to the state PAYG system. This step was motivated by an urgent need to push the budget deficit in 2011 below 3 percent of GDP, and possibly will lead to the destruction of the already reformed system. This is another case of the private pension scheme nationalization since the last "successful" Argentinean case from 2008. However, at least for the comparative purposes, it does not prevent us from observing its historical financial performance.

Second Pillar:

Up till now, Hungary has run a defined contribution system based on the individual retirement accounts. When introduced in 1998, the participation became mandatory for everyone below the age of 42. In total 8 percent of the employee's gross wage is directed into the second pension pillar. The pension fund needs to obtain a license from Hungarian Financial Supervisory Authority (HFSA), and to fulfill the minimum criteria for membership base to be allowed to operate in the scheme. The asset management may be executed internally by the mandatory pension fund or may be delegated. All participants (the owners of the pension fund) form a general assembly that votes for the mandatory pension fund management for the next 5 years of operation.

The Hungarian mandatory pension funds face the quantitative restrictions on their investment policies. However, the limits are slightly less restrictive than in other CEE countries. For example, since 2006 the equity exposure has not been subject to any quantitative limitation, and the investment funds exposure is limited up to 50 percent of total assets. The investment into the mortgage bonds cannot exceed 25 percent. Other more risky asset-classes exposure is limited to the maximum amount of 10 percent. There is an important restriction limiting the foreign market exposure to maximum 30 percent of portfolio assets.

Nevertheless, the strict minimum return guarantee requirement present in the Hungarian second pension pillar complements looser quantitative restriction. Each year the HFSA settles the expected range of return within which the mandatory pension funds should occur. Most often, the long-term government bond returns

serve as a benchmark, and if the pension fund returns do not exceed the official lower bound of the announced range, the remaining amount needs to be added from its reserve fund. The reserve fund is being credited mainly from the excess returns over the upper bound of the required rate of return, and also regularly from the part of monthly participant contributions. The benefits are paid in the form of annuity, which could be either offered by the pension fund or bought from the insurance company. The earlier withdrawal is currently not possible. The Hungarian mandatory pension funds gather the assets HUF 2 775 bn. (approx. € 10.24 bn.), which stands for around 10 percent of Hungarian GDP[28].

By 2009, the majority of assets of Hungarian mandatory PFs were invested into the government bonds (52 percent), and mutual funds exposure topped up at 34 percent. The equity held by mandatory PFs amounted to 10 percent of total assets, the cash and deposits stood for 2 percent, and the remaining 3 percent were invested into other investment instruments. Over the period observed, the scheme managed to deliver 6.6 percent of annual nominal returns (equivalent of 0.7 real returns).

However, as mentioned in the beginning, since October 2010 the scheme has been facing an existential threat. As of November 1, 2010 the Hungarian government announced its decision to suspend the regular contributions into the scheme up till December 2011. Moreover, the government has set the deadline for scheme participants to switch back to the state PAYG pillar. In case of not switching the participants face the option of losing their state pension entitlements. Currently, the share of the state pension entitlements on the total pension entitlement stands for about 70 percent.

Third Pillar:

The voluntary private pension scheme in Hungary was introduced in early 90s. By 2010 the scheme managed the assets in the amount of HUN 803bn. (€ 2.96 bn.), and covered over 1.3 mil. of active participants, and there were 63 licensed voluntary pension funds. Each of the PFs can offer up to three pension plans. It is a DC scheme with individual accounts. Investment limits and required rates of returns are similar

[28] HUF/EUR = 0.00369 exchange rate as of 31.12. 2009 was obtained from ECB: http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html, and the information about Hungarian GDP was obtained from EUROSTAT.

as in the case of mandatory Hungarian pension scheme. Up to the same date, the voluntary private pension funds held over 70 percent of its assets in debt securities. The exposure to mutual funds reached 17 percent, and over 6 percent were invested in equity. The remaining 7 percent were invested into money market instruments or other forms of investments. Concerning the investment performance, over the last decade (2000-2009) the scheme managed to deliver 6.4 percent of annual nominal investment returns (equivalent to 0.5 real returns). Interestingly, the performance is very similar to the performance of the mandatory scheme, only lower by 0.2 percentage points.

3.4.4. Poland

During the last decade, Poland (right behind Hungary) became a pioneer country within CEE region concerning the implementation of a systematic pension reform. The major reform was introduced already in 1999. Besides a creation of mandatory private pension scheme based on the individual accounts, the Polish government also decided to reform its PAYG system into the system of notional defined contribution (NDC) system. The voluntary occupational plans were also established in 1999. Since then, the development of private pension market has advanced significantly. Additionally, in 2004, the reform of the first and second pillar was complemented by the creation of voluntary pension savings. Today, because of an early reform realization and its parameters, Poland is (by far) a leading market within region in terms of the pension assets under management.

However, similarly as in the case of Hungary, also Polish government considers an overhaul of the role of its mandatory pension scheme. According to the latest debates, it considers submission of a reform bill in January 2011, which would cut the contributions into the system from 7.3 percent to 2.3 percent by April 2011. A new contribution rate into the scheme is intended to rise steadily up to the level of 3.5 percent of employee's gross monthly salary by 2017 (which is less than half of the contribution rate in the last decade). Such a change is motivated mainly by the current state of Polish public finances[29].

Second Pillar:

[29] For more information see: http://www.reuters.com/article/idUSLDE6BT11Y20101230

In Poland, the mandatory private pension scheme with the individual accounts has been in place since 1999. It is a defined contribution scheme, and is being operated by the open pension funds (OPFs). In total, 7.3 percent of the employee's gross wage goes into the OPFs as a contribution. In time of the reform, the participation in the second pillar became mandatory for people below 30. Those over 30 were given an option to opt-out from the first pillar, however with no reverse option. There is a separation between OPFs and the managing companies known as the general pension fund society (GPFS). Since 2004 each of GPFS can establish two OPFs with different investment profiles.

Similarly to other CEE countries, the investment policy of OPFs is subject to regulatory quantitative restrictions. More specifically, up to 40 percent of total assets can be invested into the equity traded on the regulated stock exchange market, and additional 10 percent is allowed to be invested into the equities from regulated non-exchange stock market. The OPFs exposure to corporate bonds is restricted to the maximum of 40 percent. OPFs may also invest into the certificates of investment funds. Nevertheless, the exposure to close-end funds is limited to 10 percent, and to 15 percent in the case of open-end funds. Maximum of 20 percent of total assets may be held in the form of bank deposits. On the top of these investment restrictions, Poland decided to concentrate the OPFs investments on the domestic market as the share of foreign investments in OPFs portfolio is restricted to only 5 percent[30].

Besides the quantitative investment restrictions, Poland has adopted an approach of minimum return guarantees. Expressed in relative terms, any OPF needs to provide a minimum required rate of return which is defined as the lower value of the following two: 50 percent of the average (annualized) real return of the market over the last 36 months or the average annualized real rate of return over the last 36 months minus 4 percentage points. For each of the OPFs, GPFS needs to create an individual reserve account. The usage of the reserve account is to cover the deficit between the OPFs performance and the minimum required performance and is financed through the resources of GPFS. If the reserve account cannot cover the deficits of OPFs, the

[30] Locking of the investment into the local market was motivated by the need for development of the domestic capital market. However, as documented in Zalewska (2006), this was not the case. Some immediate benefits were evident. Although after several years of the operation of the scheme, the relative performance of the Polish capital market returned to its pre-reform levels or worse.

bankruptcy is filed on GPFS. In such a case, the National Guarantee Fund stands in for respective OPF as a successor.

Distribution of the benefits is linked to the participant's obligation to buy an annuity in the retirement. According to the law, these annuities need to be inflation indexed, and the first benefits were paid out in 2009. As Poland runs an EET system, the contributions are tax-deductible, as well as the investment income is tax free, however the pension benefits are subject to taxation. By 2009, the second pillar gathered the means amounting to 179 bn. PLN (€ 43.5 bn.), an equivalent of 17 percent of country's GDP[31]. The managers allocated the asset mainly into the government bonds and bills. In 2009 this exposure exceeded 66 percent. The equity exposition reaching over 30 percent is the largest out of the observed countries. The remaining 4 percent were held mainly in cash and deposits. Out of all observed schemes, the Polish scheme managed to deliver the highest annual nominal (8.5 percent) and also real returns (5 percent).

Third Pillar:

In comparison with the success of Polish second pillar, the third pension pillar based on the voluntary occupational pension plans (PFEs, PPEs) and personal pension accounts (IKE) has not reached a high coverage yet[32]. After the start up in 1999, the incentives for participation in third pillar were rather limited. This was partly relaxed in 2004 when the process of registering and running an occupational pension schemes became simplified and the employers were given a flexibility to suspend their contributions into the scheme for a certain period of time. However, the main obstacles that hinder a higher coverage remain unaddressed. The tax incentives are limited to tax free capital gains (the contributions are on after-tax basis), and the amount of contributions is limited to the maximum of 7 percent of employees salary. The investment limits of PPEs are more relaxed compared to the second pillar restrictions. However, the foreign (OECD only) markets exposure is also limited to maximum of 5 percent of total assets. By 2009, the PPEs and PFEs schemes gathered the assets amounting to 4.3 bn. PLN (around € 1 bn., an equivalent of 0.4 percent of

[31] PLN/EUR = 0.2432 exchange rate as of 31.12. 2009 was obtained from ECB: http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html, and information about Polish GDP was obtained from EUROSTAT.

[32] By 2009 less than 3 percent of total workforce participated in the scheme (325 thousand of workers, see Guardiancich (2010)).

Polish GDP). The asset allocation of PFEs and PPEs does not differ significantly from the mandatory pension scheme, although it is more conservative. In total 62 percent of assets is invested into the debt securities, T-bills stood up for 23 percent of investments, and the equity exposure did not exceed 10 percent by 2009. The remaining 5 percent were invested into other forms of investment instruments. Out of the available data from Polish Financial Supervision Authority (PFSA)[33], over the period 2005-2009 the PFEs and PPEs managed to deliver average nominal annual returns 4.6 percent, which corresponds to the levels of 1.7 of real returns.

3.4.5. Slovak Republic

The current pension system in Slovak Republic based on three pillars has been in place since 2005. The main driver for the introduction of the mandatory second pension pillar was the low effectiveness of the voluntary pension pillar originally introduced in 1997. The reform in 2005 also included the parametric changes in PAYG system, which prolonged the age of retirement to 62. Since then the private pension market has developed significantly. However, repetitive political pressures endanger the promising development and may partially reverse the already implemented changes.

Second pillar:

The main building block of the Slovakian pension reform was the introduction of the individual defined contribution scheme based on the individual accounts. The contribution rate is set at the level of 9 percent of employee's gross wage, and is ultimately paid by an employer. The scheme is operated by the pension asset management companies (DSS). The entry condition for each DSS to operate in the market is to attain a minimum of 50 thousand of participants after first 18 months of its operation.

Each DSS needs to provide 3 alternative funds with different risk/return profiles. In a conservative fund, 100 percent of portfolio needs to be allocated in the bonds or money market instruments. In a balanced fund at least 50 percent of total assets must be invested into bonds or money market instruments, while the equity exposure cannot exceed 50 percent of the total portfolio holdings. Finally, the investment

[33] Available at: http://www.knf.gov.pl/en/about_the_market/Pension_system/Financial_and_statistical_data/anual_epf.html

regulation for growth fund is relaxed as the equity exposure might stand for up to 80 percent of growth PFs portfolio. Interestingly, for each of the funds there needs to be a separate manager, and the portfolio management cannot be outsourced onto other asset-management companies.

There are certain regulations limiting the participant's exposure to the riskier fund strategies. Scheme participants are free to choose from 3 described investment scenarios with more than 15 years up to retirement, those with 7 to 15 years before retirement cannot invest into the growth fund, and the participants with less than 7 years before reaching the retirement age can invest only into the conservative fund.

The scheme (as in most other CEE private pension schemes) also imposes the requirement on DSSs to provide the minimum return guarantees. They are counted on 24-months basis and differ based on the type of the fund. For conservative fund it is the lower of the two: the market average yield over last 24 months minus one percentage point or 90 percent of this average. For balanced fund it is the lower of the market average yield over last 24 months minus three percentage points or 70 percent of this difference. Finally, for growth fund it is the lower of the market average yield over last 24 months minus five percentage points or 50 percent of this difference. The contributions into the second pillar are exempt from taxation. The capital gains are tax free. On the other hand, benefits paid out from the system are subject to taxation (EET type). By 2009, the second pension pillar in Slovakia gathered the means of € 2.9 bn., which is around 4.7 percent of Slovakian GDP.

However, in 2009 the political representation decided to change the reference period for minimum return guarantees from 24 months to 6 months. Moreover, the current rules state that over the 6 months period all pension schemes within mandatory pillar need to deliver the non-negative portfolio returns. Thus, under this arrangement, any PFs losses over the 6 months reference period will have to be covered by the shareholders capital. This arrangement resulted into the unification of the investment strategies of all three mandatory schemes. As a matter of fact, by the end of 2009 the share of equities in the investment portfolio fell to zero. The portfolio share of government bonds ranged from 32 to 38 percent, the remaining part of the portfolio consisted from the money market instruments – from 62 to 68 percent. Also the mandatory participation in the scheme has been temporarily removed, although the

new government favors its re-introduction. As a result of these political issues, and also due to the presence of the financial crisis, the scheme returns (despite the favor conditions since its introduction) disappointing. The average nominal returns ranged from 1.1 to 2.7 percent, which corresponds to real returns in the range of -1.6 to 0 percent.

Third pillar

The voluntary private pension scheme came into the place in 1997 and it experienced a major reform in 2004 changing its status from the supplementary pension insurance into the supplementary pension saving scheme. It is a defined contribution scheme with the individual accounts allowing, which also allows the employers to contribute into the employees' accounts. The possibility to deduct up to approx. € 400 (SKK 12 000) annually from the contributor's tax base, and to receive the contributions from an employer (also tax deductable up to 6 percent of employee's gross salary), have been the main driving forces behind the development of Slovakian third pension pillar. Currently, there are four supplementary pension companies (DDS) offering 14 alternative pension plans.

Nevertheless, the political pressures also brought the changes into the characteristics of voluntary pension pillar. In fact, the tax deductibility of individual contributions is being abolished by January 2011. On the other hand, after long political debates, the tax deductibility of the employer contributions up to 6 percent of employee's salary has been retained. Contrary from the mandatory pension scheme, the voluntary Slovakian scheme is not burdened with stringent investment regulation as PFs may invest up to 100 percent of the assets into the listed shares. An absence of stringent investment regulation has led into the various asset allocations of respective pension plans. Still, the estimated results for 2010, where e.g. growth PFs reached an average nominal return of 4.5 percent[34] in comparison with 1.1 percent[35] delivered by mandatory growth PFs, may be perceived as a price of the Slovakian second pillar regulation.

[34] See: http://hnonline.sk/ekonomika/c1-48881860-treti-pilier-v-tomto-roku-zarobil.
[35] Source: The Association of Slovakian mandatory pension funds.

3.5. Data description and other considerations:

3.5.1. Data description

Various data sources have been identified so that the analysis comparing the financial performance of private pension schemes would become plausible. The periodic returns of the observed schemes were gathered mainly through the interaction with the pension fund associations of chosen countries or from the active market participants. The series of data for country specific benchmarks have been obtained from a number of databases. For the returns on the benchmark indices, the Global Financial Data is the most utilized source. Alternatively, other databases such as MSCI and others are used to complement the necessary data. The detailed information about sources of country specific data can be found in the Annex I.

One of the goals of this work was to come up with the dataset, which would allow us to compare the financial performance of chosen pension schemes over the last decade (2000 – 2010). Unfortunately, some limitations hindering such a comparison need to be taken into account. Obviously, part of the chosen schemes were implemented later than in 2000, thus there are no observation points dating back to 2000. This is the case of Bulgaria (2002), Croatia (2002) and the Slovak Republic (2005). Furthermore, the data for some countries in the required form (as collected) were not available from the very beginning of schemes operation due to various reasons. For example, for some countries there has been a change of regulatory agency (e.g. the case of Bulgaria or Poland), which brought an alteration in the reporting standards (usually bringing the more detailed scheme information). However, the new regulatory agencies often do not publish data from the earlier periods. The sources of periodic returns of the observed schemes in the aggregated form are presented in Table 5.

Table 5: Dataset description

Country	Data frequency	Period[36]	Data source
Czech Republic	Quarterly calculated returns	2000-2010	Czech Association of Pension Funds, Annual Reports of PFs
Poland	Quarterly returns	2000-2010	Polish Financial Supervisory Authority
Hungary	Quarterly calculated returns	2000-2010	Hungarian Financial Supervisory Authority
Slovak Republic	Monthly returns	2005-2010	The Association of Pension Funds Management Companies
Bulgaria	Quarterly calculated returns	2004-2010	Bulgarian Association of Supplementary Pension Security Companies
Croatia	Quarterly calculated returns	2002-2010	Raiffeisen Mandatory Pension Fund Management Company Plc.

Source: Author

In order to come up with the aggregate rates of return for a given period of time the following considerations need to be taken into account. In fact, the aggregate rate of return should be understood as a growth of the total wealth as opposed to the beginning of the period. First, the returns for each pension fund for a given period are to be counted. From these returns the weighted average return, reflecting the relative asset weight of each fund at the beginning of the period, will be calculated. This approach assumes all the inflow and withdrawals to happen at the end of each period, and is often titled as time weighted returns (Walker and Iglesias, 2007).

3.5.2. Other considerations

3.5.2.1. Investment regulations

Generally, there are two alternative approaches to the regulation of the private pension industry. The first option is to use the principle of a prudent man. This approach, rather than imposing the stringent investment limits, aims at the regulation of behavioral standards of PF managers. The second alternative is to go with the option of quantitative portfolio restrictions. This approach, by placing numerical boundaries on various asset-classes exposures, predetermines the composition of the PFs portfolios.

[36] Observations for 2010 cover either first half or first three quarters of the year 2010, depending on the data availability at the time of the work completion.

The choice between these two approaches, as Tapia (2008) states, may be motivated by the relative development (maturity) of capital markets in respective countries. Thus, one can expect the countries with relatively developed capital markets to have a lighter investment regulation, while the countries with capital markets in early stages of development will tend to more stringent forms of investment regulation. Other factors with the direct influence on extent of the investment regulation are the mandatory (more regulated) or voluntary scheme characteristics, and the defined-contribution (stronger regulation is expected) or the defined-benefit nature of the scheme.

The investment regulation is a complex issue surrounding each of the respective pension schemes. As most of the observed schemes are mandatory and of the defined-contribution type and most of the observed CEE countries also share the characteristics of relatively underdeveloped capital market, one may expect the schemes will operate in relatively strongly regulated environment, which is also the case. Most of the observed schemes have regulation standards in the form of investment restrictions or minimum return guarantees in place. The differences in regulation standards are important as they directly influence the potential structure of schemes portfolios. As a consequence, these differences have a direct impact on the potential returns that could be delivered by the respective schemes. In the following table, the investment regulations in target countries are summarized.

Table 6: The summary of investment regulation features in target countries

Country	Minimum return guarantee	Equity exposure	Mutual funds exposure	Direct limits on foreign investment
Bulgaria	60 percent of the asset weighted average performance over last 24 months	mandatory ≤ 20%; voluntary – no limit	Mandatory ≤ 15% voluntary – no limit	Foreign currency limits (outside BGN and EUR): mandatory ≤ 20%; voluntary ≤ 30%
Croatia	Weighted arithmetic mean of average rates of return of all PFs over the previous three years, reduced by two percentage points.	≤ 30%	≤ 15%	≤ 15% (MPF) ≤ 20% (VPF)
Czech Republic	Implicitly annual return ≥ 0 (see section 2.1.7.)	No limit	≤ 10% in close-ended ≤ 15% in open-ended	Restricted only to securities traded in OECD markets. 70% needs to be denominated in CZK
Hungary	85 % of the official return index of long-term government bonds over the last 3 years	≤ 50% (MPF), ≤ 60% (VPF)	≤ 50%	≤ 20% (MPF) ≤ 30% (VPF)
Poland	The lower of the following 2: The average real annualized rate of return of the last 36 months of all PFs minus 4 percentage point or 50% of the rate	In total ≤ 50%; up to 40 % into the stock exchange listed companies, up to 10 % into the non-listed stocks	≤ 10% in close-ended; ≤ 15% in open-ended	≤ 5 %
Slovak Republic	A comparative element: The average yield during the past 24 months. The PFs need to guarantee the lower of following two: - conservative (90% or minus 1% point) - balanced (70% or minus 3% points) - growth (50% or minus 5% points)[37]	0 - conservative 50% - balanced 80% - growth	0 - conservative 50% - balanced 80% - growth	≤ 50%

Source: Author

[37] See the section 3.4.5. for the most recent update on the Slovakian minimum return guarantees.

3.5.2.2. Asset valuation

Asset valuation is another issue that could make the comparison of the schemes financial performance based on the historical returns methodologically more challenging. For example when the instruments are not marked to market, the returns on these instruments will always accrue the interest rate of the purchase. Also, when the instruments are seldom traded, the market price of the instrument does not change often. This might artificially lower the volatility of portfolio returns, which has a direct link to the value of SR. In fact, it is reasonable to expect that in comparison with the fully developed capital markets the financial instruments are not traded that frequently. On the other hand, most of the CEE countries entering the analysis are at the similar stages of capital market development. Hence, the potential bias of SRs estimation, stemming from the differences in asset valuation standards, is expected to be similar in these countries. Below, Table 7 summarizes the investment valuation techniques used for valuation of the assets in the analyzed countries.

Table 7: Summary of asset valuation approaches in target countries

Country	Valuation Methodology
Czech Republic	Market value except financial instruments held to maturity. An average price of executed transactions for the financial instruments held to maturity, and for the ones that are not actively traded in the market.
Poland	Market value. Securities not publicly traded are valued at the price of last purchase.
Hungary	Market value.
Slovak Republic	Market value.
Bulgaria	Market value.
Croatia	Market value.

Source: Author

3.6. Results

In the following subchapter, we present the results of the observations for individual countries. First, the annual nominal and real returns of pension schemes will be introduced. This analysis serves as a basic orientation in the financial performance among the respective pension schemes. However, various factors[38] prevent us to base the comparative analysis of the financial performance of pension schemes solely on the basis of just reported returns. To account for some of these factors, the Sharpe ratios and the Sharpe style analysis were conducted. The main strength of the used methodology is the adjustment for the country specific risks by comparing the scheme returns against the country-specific benchmarks. This kind of analysis also considers the volatility of observed returns. In brief, it provides the answers to the question whether the respective pension schemes over the observation period have beaten the country-specific low risk benchmarks. However, it should be kept in mind that the cross-country comparability of the obtained results remains limited, as a number of the above mentioned factors remain unresolved.

3.6.1. Schemes investment returns and standard deviations

We start the analysis of private pension schemes financial performance by the observation of nominal and real returns of each respective scheme delivered over the period observed. The real investment returns and the standard deviations of these returns will serve as the initial standpoint for evaluation of the financial performance. There are many restrictions such as idiosyncratic characteristics of each respective scheme, the regulatory restrictions together with different reporting frameworks, different time periods covered, also the uneven fee levels (see e.g. Tapia and Yermo, 2008) and a range of other limitations that prevent from constituting the analysis of the financial performance just on the real returns of the system. However, it is still useful to examine the distribution of the investment returns across the observed countries to get the initial view of the fact how the Czech scheme stands in comparison with other reformed countries. These results are summarizes the table below. There are three columns in Table 8, the first column stands for the average

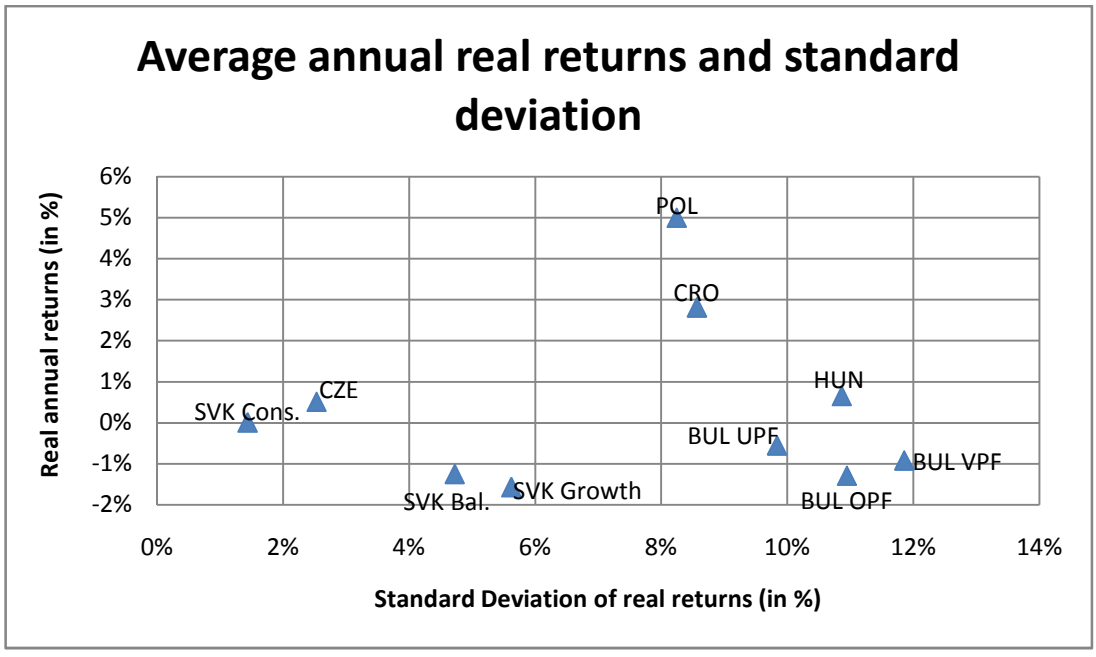
[38] Among these factors one can mention e.g. different stages of financial markets development and other economy characteristics (being reflected in different country-specific risk positions). Also the differences in investment regulation (asset exposure limits and minimum return guarantees), reporting frameworks and methodologies used for portfolio valuations cannot be ignored. Furthermore, the results of the scheme observations are often reached over the unmatched time periods – another factor that also needs to be kept in mind.

annual returns, the second for the average real returns (nominal returns adjusted for inflation rates), and the last column stands for the standard deviation of the average real returns.

Table 8: The average nominal and real scheme returns reached over the periods observed.

Country	Pillar	Average annual return	Average real annual returns[39]	Standard deviation	Period[40]
BUL UPFs	II.	4,54%	-0,55%	9,84%	2004-2010
BUL OPFs	II.	3,96%	-1,29%	10,94%	2004-2010
BUL VPFs	III.	4,24%	-0,92%	11,85%	2004-2010
CRO	II.	5,61%	2,81%	8,56%	2002-2010
CZE	III.	3,03%	0,51%	2,53%	2000-2010
HUN	II.	6,59%	0,65%	10,86%	2000-2010
POL	II.	8,50%	4,99%	8,24%	2000-2010
SVK C.	II.	2,71%	0,01%	1,44%	2005-2010
SVK B.	II.	1,45%	-1,25%	4,72%	2005-2010
SVK G.	II.	1,13%	-1,57%	5,62%	2005-2010

Figure 11: The average annual real returns and standard deviation over the period observed



Source of Table 8 and Figure 11: Author's calculations

[39] The country's annual inflation rates were obtained from Eurostat: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1. Data for Croatia were obtained Croatian bureau of statistics: http://www.dzs.hr/.

[40] Observations for 2010 cover either first half or first three quarters of the year 2010, depending on the data availability at the time of the work completion.

Keeping in mind the limited data comparability stemming from the factors mentioned above, the ambition of this section is to provide us with the initial overview that will set the boundaries for respective performances. The calculations from the collected data suggest that there is no clear relationship between the real scheme annual returns and the standard deviation of these returns. There are countries with low levels of real returns in combination with low volatility of returns (Czech Republic or all three Slovakian schemes), there is a country with relatively high real returns that were reached with medium volatility (Poland), and finally there is also a country that experienced the low (negative) real returns in combination with high volatility of these returns (all observed pension schemes in Bulgaria).

These preliminary findings roughly correspond with the ones of Tapia (2008a). In his research project he gathers the data for 23 OECD countries over the period 2000-2005, and he also does not find a clear connection between the real returns of the scheme and the standard deviation of these returns. However, he points out that most of the countries experienced the low levels of returns with the relatively low levels of volatility.

Generally speaking, the levels of investment returns and the volatility of these returns vary over time. Indeed, the values of observed parameters also depend on the length of the observation period that has been covered. This influence is especially evident in the case of Bulgaria, where the standard deviation of returns ranged from 15 to almost 18 percent with the average real returns turning out to be negative. The positive market situation in 2007 materialized in the returns as high as 15-18 percent. However, these high levels of returns were more than offset in 2008 when all three Bulgarian pension schemes realized remarkable losses amounting to negative annual investment returns in the range of 35 to 40 percent. The presence of the global financial crisis in 2008-2009 loaded the financial performance of most of the observed systems significantly. However, its foot-print is even more evident in the case of schemes with relatively short periods of operation. In these cases it is reasonable to expect that the returns variation will decrease as the differences in consecutive returns will stabilize with the growing maturity of the scheme, and also possibly due to the expected stabilization of the situation in the world financial markets.

3.6.2. Sharpe ratios and Sharpe style analysis

As addressed in the methodological section, four alternative benchmarks were used as a proxy for the risk-free (or low risk) asset in order to estimate the scheme SRs. Due to different yields on domestic risk-free (low risk) benchmark assets, the analysis also uses the international risk-free benchmark[41] so that the scheme performance could be compared with the reference asset that is available to all schemes, and which also embodies the same and the lowest possible (contrary the respective domestic benchmarks) level of risk. Thus, as reference benchmarks the returns on the following instruments were used: A short-term local T-bill (STL), a long-term local government bonds (LTL), a short-term German T-bill (STG), and long-term German government bond (LTG) both denominated into the local currency[42]. The quarterly (monthly) holding period returns of the benchmark assets have been tracked. These returns were subtracted from the returns of the schemes so that the excess returns and standard deviation of these returns could be obtained. Out of these values, the estimation of SR for each respective benchmark is obtained. Further, by employing a procedure introduced in Lo (2002), the results were tested whether the estimated SRs significantly differ from zero.

The Sharpe style analysis brought by Sharpe (1992) is used for the estimation of the investment style of respective pension schemes. Again, it is necessary to keep in mind that the motivation of the style (attribution) analysis is not to judge whether PFs invested optimally. Rather it estimates the scheme portfolio weights that reflect the investment style of the pension scheme in order to find out whether there has been an increase in wealth delivered through the active management as compared to the passive investment strategies. To come up with these estimations, six different asset classes (STL; LTL; STG; LTG; local equity index; global equity index – all denominated in the local currency) were used to estimate the asset weights in each of the observed schemes. The returns of the portfolio (composed of the estimated weights of the above mentioned six asset classes) are then compared with the actual portfolio returns so that the quality of active investment management decisions could be evaluated.

[41] German bonds and T-bills were chosen as European reference benchmarks as these instruments bear the lowest risk out of the available instruments within observed categories.

[42] The limitation of this approach is that the exchange rate fluctuations are fully projected into the returns on German benchmarks denominated into the domestic currencies. Thus, the volatility of excess returns may artificially lower the value of estimated SRs.

The chosen methodology tackles some of the limitations mentioned in the section 3.6.1. that aggravate the international comparison of the schemes financial performances. Mainly, the methodology accounts for the risk levels of the respective schemes as the country-specific risk premiums are reflected in the investment returns of the observed benchmarks used for SRs computations. The methodology also captures the elementary dynamics of the state of the economies as the risk-free changes are reflected in the changes of excess returns. However, the other limitations such as the various investment restrictions, the minimum return guarantees, the diverse fee structures or the unmatched observation periods remain unresolved. Its impact on the financial performance of pension schemes is not treated by this type of analysis, and therefore needs to be considered when interpreting the results.

Table 9 below summarizes the results of the SRs computations and of the Sharpe style analysis for each of the observed pension schemes. Altogether, there are there are six CEE countries (including the Czech Republic) entering this data exercise. If more schemes for individual country are present (the case of Bulgaria and the Slovak Republic), the results for each of them are presented separately. Data sources of the scheme returns and observation periods used for SRs computations are also mentioned in this table. The scheme returns, depending on the accounting rules of the respective schemes, are derived either from asset weighted returns of scheme index values (if available) or from the aggregate scheme returns. Nevertheless, both are expressed as periodic annualized net returns[43], so that scheme excess returns (the difference between scheme returns and returns of chosen benchmarks) and standard deviation of excess returns necessary for SR computations could be obtained. Finally, the numbers in Table 9 stand for the schemes SR estimates for chosen benchmarks and t-test values indicating the significance levels of these estimates.

To understand the SR correctly, it represents the ratio of the scheme excess returns with respect to the standard deviation of these excess returns. Thus, a positive value of SR indicates that the scheme managed to deliver higher returns than its low-risk reference benchmark. On the other hand, negative SR value signals that the returns on low-risk reference benchmark were higher than the ones delivered by the pension scheme. The inability of the scheme to deliver higher returns respect to its reference

[43] By net returns we mean the returns which are available to the scheme participants. Those are the investment returns net of all types of fees and scheme costs.

benchmark will be addressed as an underperformance of the scheme. Also, as the SR is a measure of excess returns over the unit of risk, the higher volatility of the returns also results in the lower values of SR. In general, the scheme with the highest value of SRs shall be preferred among the investors (see the section 3.3.1).

Table 9: Summary of the results obtained

Benchmarks used for Sharpe ratios computations								***Style analysis***		***Scheme***
STL		**LTL**		**STG**		**LTG**				
SR	**t-test**	**SR**	**t-test**	**SR**	**t-test**	**SR**	**t-test**	**SR**	**t-test**	
Czech Republic - quarterly calculated aggregate scheme returns: Sep 2000 – Sep 2010										
0,10	0,63	-0,84	-4,07	0,34	2,02	-0,06	-0,39	0,02	0,20	
Bulgaria - quarterly calculated (asset weighted) index returns: Apr 2004 – Sep 2010										
0,06	0,33	-0,08	-0,44	0,12	0,60	0,02	0,12	0,08	0,43	*UPFs*
0,01	0,06	-0,12	-0,62	0,06	0,32	-0,02	-0,12	-0,03	-0,16	*OPFs*
0,03	0,13	-0,10	-0,51	0,07	0,37	-0,01	-0,04	-0,04	-0,03	*VPFs*
Croatia - quarterly calculated (asset weighted) index returns: Apr 2002 - Sep 2010										
0,10	0,59	-0,09	-0,53	0,24	1,34	0,09	0,54	-0,10	-0,58	
Hungary - quarterly calculated aggregate scheme returns: Jan 2000 - Sep 2010										
-0,10	-0,66	-0,03	-0,22	0,26	1,64	0,17	1,11	0,01	0,06	
Poland - monthly calculated (asset weighted) index returns: Jan 2000 - Oct 2010										
0,12	1,38	0,15	1,65	0,37	3,81	0,30	3,16	0,10	1,13	
Slovak Republic - monthly calculated (asset weighted) index returns: Apr 2005 – Jun 2010										
-0,11	-0,83	-0,58	-3,65	0,54	3,49	-0,06	-0,47	0,02	0,20	*Cons.*
-0,35	-2,54	-0,51	-3,36	-0,10	-0,78	-0,34	-2,48	-0,02	-0,16	*Bal.*
-0,35	-2,51	-0,48	-3,21	-0,15	-1,13	-0,34	-2,48	-0,07	-0,52	*Growth*

Source: Author's calculations

In the following section the results of the observations will be presented separately for each individual country. For each of the scheme there is a table, which summarizes the findings. In the table the results of the Sharpe ratio estimations (SR), t-test values for SRs estimates are presented. Also the excess returns over the respective benchmarks and the standard deviation of the excess returns together with the number of observations are to be found in each of the tables summarizing the computed results.

3.6.2.1. Czech Republic

Data characteristics:

- Quarterly calculated net returns[44]
- Period: September 2000 - September 2010
- In total 40 observation points

The results for the Czech voluntary private pension scheme (presented in Table 10) indicate on the positive values of SRs (0.1 and 0.34) when measured against both (local and foreign) short-term benchmark instruments, although only in the case of German 3-month T-bills it proved to be significantly different from zero. On the other hand, SR values for both long-term benchmark instruments turned out to be negative. This was especially evident in the case of Czech 10-year government bonds where the SR estimates (-0.84) reached the lowest value out of all schemes observed.

To understand the results correctly, this does not mean that the scheme has delivered the highest negative excess returns over this respective benchmark[45], but it rather signals that the scheme (negative) excess returns in combination with the relatively stable volatility of the excess returns (expressed by its standard deviation[46]), resulted in the largest negative performance based on the SR indicator. The highest negative value of SR estimate reflects on the fact that the negative excess returns over this benchmark have been delivered persistently over the period observed. Moreover, this underperformance is underlined by a strong statistical significance of this estimate. Such a poor financial performance reached against the domestic long-term bonds could be explained by several factors.

The presence of the legislative arrangement requiring PFs to deliver the non-negative returns per each fiscal year prevents the scheme from accomplishing its maximal long-term potential returns. This short-term oriented legislative measure shifts the

[44] In case of the Czech Republic the returns were calculated from the net returns that were quarterly reported to the Association of Pension Funds of the Czech Republic. These returns stand for the share of the quarterly net profit (in CZK) of each pension fund on total value of the means of participants.

[45] The Slovakian growth and balanced scheme (-3.3 percent and -2.87 percent respectively) as well as the Bulgarian OPF and VPF schemes experienced higher negative excess returns than the Czech voluntary private pension scheme (-2.11 percent and -1.84 percent respectively) when measured against the domestic long-term benchmark.

[46] The standard deviation of the excess returns turned up to be much lower in the case of the Czech Republic (1.92 percent) in comparison with the e.g. Slovakian growth and balanced schemes (5.63 percent and 6.91 percent) or Bulgarian OPF and VPF schemes (17.45 percent and 18.82 percent), see Tables 10, 14, 16, 24, 26 and others for its comparison.

investment focus of PF managers from "maximizing the long-term returns" approach rather to "minimizing the short-term losses" strategy. This is reflected then by the choice of a strongly conservative investment strategy[47]. With no incentives to deliver (or penalizations for not delivering) higher portfolio returns in the long-run (where the fluctuations of the returns would be intrinsic and inevitable), the PFs behave rationally within the legally defined boundaries and "voluntarily" provide the scheme participants with stable (but low) annual returns.

Next factor, weighting the financial performance of the scheme downwards, is the amount of total PFs costs that absorb a part of the realized scheme returns. As mentioned in the Chapter 2, there are no legal limitations on the level of PFs costs, and these costs directly lower the net profit of the scheme. As documented in the section 2.3.4., the cost side of PFs (Czech equivalent to fees) expressed in relative terms improved in the second part of the decade due to the economies of scale, and an increasing maturity of the scheme. However, the level of acquisition costs deteriorates relatively slowly and still considerably burdens the performance of the scheme. In fact, the PF returns underperformed against returns of the 10-year Czech government bonds by 1.61 percentage points annually. Interestingly, this roughly corresponds to the historic average level of the sum of operational and acquisition costs of the system.

Also, the market situation, where the investment strategies of PFs do not differ from each other, may be far from optimal. As all the participants need to be treated equally, the PFs do not have a room for creating more investment strategies to satisfy the diverse needs of participants (stemming from e.g. different age categories), which could diversify the system resources, and could offer a wider range of more complying risk/return combinations.

Besides the computation of four different SR values, also the Sharpe style analysis has been performed. However, its findings need to be taken very cautiously due its R-square value (0.43), which is the lowest out of all schemes observed. The low R-square signals on a weaker connection between the net financial returns of the scheme and the returns of chosen asset classes, as there are other factors that co-

[47] Since 1999 the average equity exposure has not exceeded 8 percent with marginal exposures to other riskier asset classes.

determine its net financial results (e.g. schemes costs). Taking this into consideration, the SR value of the style analysis turned out to be positive, which would point on the presence of the market selection/timing ability of the Czech PF management. However, the SR estimate for style analysis does not appear to be significantly different from zero. Concerning the estimated portfolio weights it underlines the expectations as it is dominated by the Czech bonds (both long-term and short-term).

Table 10: The estimated Sharpe ratios values for Czech voluntary private pension funds:

VPFs	STL	LTL	STG	LTG	Style analysis
SR	0,0996	-0,8409	0,3377	-0,0622	0,0214
t-test	0,6270	-4,0706	2,0235	-0,3928	0,1985
Excess return	0,0020	-0.0161	0,0129	-0,0023	0,0042
Std. deviation	0,0196	0,0192	0,0382	0,0371	0,1965
No. observations	40	40	40	40	40

Source: Author's calculations

Table 11: The results of Sharpe style analysis for Czech voluntary private pension funds:

CZE 3M	CZE 10Y	GER 3M	GER 10 y	PX-50	Global equity	R-square
0,352	0,461	0,052	0,096	0,021	0,018	0,42950

Source: Author's calculations

3.6.2.2. Bulgaria

Data characteristics:

- Quarterly calculated (asset weighted) index returns
- Period: April 2004 - September 2010
- In total 27 observation points for each of the schemes (UPFs; OPFs; VPSs)

As described in the section 3.4., there are three types of the pension schemes in Bulgaria. All were implemented in 2002. Nevertheless, the data of PFs returns were available only since 2004 onwards. The results for each of them are presented below. Low but positive SR values in Tables 12, 14 and 16 indicate that all three pension schemes managed to deliver a modest premium when measured against the short-term (local and foreign) benchmarks over the period observed. Nonetheless, the t-test values (ranging from 0.06 to 0.6) for the SR estimates point out on the very low

levels of statistical significance. Moreover, the SRs for long-term benchmarks turned out to be negative in most of the cases (with the exception of German 10 year bonds for UPFs). However, the statistical significance of SR estimates has not been proved in any of these cases due to the high volatility of the observed scheme excess returns. These results point out that relatively high negative excess returns delivered by the OPFs and VPSs were reached under the extreme excess returns volatility, which made SRs estimates not significantly different from zero.

Finally, the complementary style analysis showed that through the market timing and/or selection the PFs managers delivered a positive premium when measured against the portfolio of the same style in the case of UPFs whereas this premium was negative for OPFs and VPFs. Again, the statistical significance has not been proved in any cases of the style analysis SR estimates. The R-square value of model used in the case of style analyses ranged between 0.71 and 0.80, which is one of the highest results. In all schemes, according to the performed Sharpe style analysis, the portfolio was dominated by the short-term investment instruments, with the equity exposure reaching around 20 percent (which is also the investment limit in the case of Bulgarian second pillar pension funds).

Table 12: The estimated Sharpe ratios values for Bulgarian Universal pension funds (UPFs):

UPFs	STL	LTL	STG	LTG	Style analysis
SR	0,06329	-0,08473	0,11685	0,02259	0,08309
t-test	0,32757	-0,43714	0,59907	0,11732	0,42878
Excess return	0,0098	-0,0134	0,0183	0,0035	0,0064
Std. deviation	0,15446	0,15821	0,15623	0,15605	0,07173
No. observations	27	27	27	27	27

Source: Author's calculations

Table 13: The results of Sharpe style analysis for Bulgarian UPFs:

BUL 3M	BUL 10Y	GER 3M	GER 10 y	Bulgarian equity	Global equity	R-square
65,58%	0,00%	0,00%	14,86%	14,56%	5,00%	0,759525

Source: Author's calculations

Table 14: The estimated Sharpe ratios values for Bulgarian Occupational PFs (OPFs):

OPFs	STL	LTL	STG	LTG	Style analysis
SR	0,0124	-0,1207	0,0613	-0,0240	-0,0300
t-test	0,0643	-0,6227	0,3180	-0,1245	-0,1557
Excess return	0,0021	-0,0211	0,0106	-0,0041	-0,0021
Std. deviation	0,1710	0,1745	0,1728	0,1725	0,0759
No. observations	27	27	27	27	27

Source: Author's calculations

Table 15: The results of Sharpe style analysis for Bulgarian OPFs:

BUL 3M	BUL 10Y	GER 3M	GER 10 y	Bulgarian equity	Global equity	R-square
73,39%	0,00%	4,32%	0,00%	16,05%	6,23%	0,7120718

Source: Author's calculations

Table 16: The estimated Sharpe ratios values for Bulgarian Voluntary pension funds (VPFs):

VPFs	STL	LTL	STG	LTG	Style analysis
SR	0,0258	-0,0978	0,0711	-0,0080	-0,0472
t-test	0,1342	-0,5058	0,3686	-0,0413	-0,0317
Excess return	0,0048	-0,0184	0,0132	-0,0015	-0,0037
Std. deviation	0,1845	0,1882	0,1863	0,1863	0,0767
No. observations	27	27	27	27	27

Source: Author's calculations

Table 17: The results of Sharpe style analysis for Bulgarian VPFs:

BUL 3M	BUL 10Y	GER 3M	GER 10 y	Bulgarian equity	Global equity	R-square
67,65%	12,35%	0,00%	0,00%	17,91%	2,09%	0,8015025

Source: Author's calculations

A couple of factors contributed to the poor financial performance of all three Bulgarian private pension schemes. The first one is the influence of the world financial crisis in 2008-2009 as none of these schemes has reached its pre-crisis levels yet[48]. Also, the financial performance of the Bulgarian private pension schemes is heavily burdened by the fee levels for which the final index values are

[48] Compared with the peak values of the scheme index values from mid-2007, in September 2010 the best-performing UPFs still fell 12 percent behind its pre-crisis levels.

lowered[49]. Finally, the low financial performance may be also partly explained by a relatively short observation period.

3.6.2.3. Croatia

Data characteristics:

- Quarterly calculated returns from indexed unit values
- Period: April 2002 - September 2010
- In total 35 observation points

The second pillar of the Croatian pension system was introduced in 2002. Since then, according to the SR estimates, the scheme has been able to deliver value a modest added when compared against the domestic (0.10) and the international short-term benchmarks (0.24). The positive premium over the short-term benchmarks was higher in the case of German T-bills. This result, due to the relatively low standard deviation of excess returns, was also close to the statistical significant level (t-test value of 1.34). Interestingly, the scheme outperformed the German 10-year bonds as the value of SR estimate is positive (0.09). On the other hand, a minor underperformance was witnessed when measured against the local long-term government bonds (SR value of -0.09). Nonetheless, in both cases the estimates are not supported by statistical significance. Better performance of the scheme when measured against the foreign benchmark was not based on the currency appreciation over the period observed[50] but mainly on the return differential between Croatian and German government bonds. The results for Croatia are somehow more positive than in case of Bulgaria as at least one of the long-term benchmarks has been beaten. The ability of the system to overcome the market discrepancies could be demonstrated on the fact that by the end of the observation period the Croatian scheme (unlike Bulgarian or Slovakian ones) has recovered to its pre-crisis levels.

The results of the Style analysis examining the PFs exposure to 6 asset-classes need to be perceived in the context of low R-square value of the estimates as according to the results only 51 percent of PF portfolio returns are explained by the rates of return

[49] Tapia and Yermo (2008) who made a cross-country comparison of the pension scheme fees showed that Bulgaria charges one of the largest fund fees (over 3 percent of assets under management), and was the imagined leader within the CEE countries.

[50] In the beginning of the scheme operation the EUR/CRO foreign exchange rate was nearly at the same level as it was by the end of 2010.

of chosen 6 asset-classes. Nevertheless, the model suggests that most (over 73 percent) of the PFs portfolio assets were invested into the long-term domestic bonds. The rest was invested into the equity and the foreign long-term bonds. Finally, the results also suggest poor management decisions in the area of market selection and/or market timing compared to the passive investment strategies as the SR for the style analysis turns out to be negative. However, as in most other cases of the style analysis, the SRs estimates do not appear to be statistically significant.

Table 18: The estimated Sharpe ratios values for Croatian private pension scheme:

VPFs	STL	LTL	STG	LTG	Style analysis
SR	0,10212	-0,09174	0,24260	0,09381	-0,10115
t-test	0,58932	-0,53047	1,33803	0,54223	-0,58387
Excess return	0,0104	-0,0093	0,0263	0,0098	-0,0072
Std. deviation	0,10194	0,10167	0,10826	0,10487	0,07173
No. observations	35	35	35	35	35

Source: Author's calculations

Table 19: The results of Sharpe style analysis for Croatian private pension scheme:

CRO 3M	CRO 10Y	GER 3M	GER 10 y	CRO equity	Global equity	R-square
0,00%	73,16%	0,00%	14,03%	11,84%	0,97%	0,51

Source: Author's calculations

3.6.2.4. Hungary

Data characteristics:

- Quarterly calculated scheme returns
- Period: January 2000 - September 2010
- In total 43 observation points

Hungarian mandatory pension scheme together with Polish and Czech schemes cover the whole observation period. The scheme has been in operation since 1998, and up to date there are 19 mandatory pension companies.

The results for Hungary are presented in Tables 20 and 21. There we observe the slightly negative values of SRs for both domestic benchmarks. These observations suggest that the scheme returns were modestly outperformed by both short-term and

long-term local benchmarks. However, the SRs estimates are not significantly different from zero due to the substantial increase in the volatility of excess returns experienced in over 2007-2010 period. On the other hand, the positive values of SRs for international benchmarks (0.26 and 0.17 respectively) suggest that over the last decade the scheme outperformed the returns over the German T-bills and 10-year bonds. Both observations (t-test values of 1.64 and 1.12) are close to the statistical significant levels.

The comparison with other studies examining the financial performance of the Hungarian scheme illustrates a considerable negative impact of the world financial crisis on the ability of Hungarian scheme to deliver sustainable positive results with respect to the chosen benchmarks. Walker and Iglesias (2007) observed that over the period June 1998 – March 2007 the values for all observed SRs turned out to be positive and statistically significant[51]. With the occurrence of the crisis (and also with omission of the performance in 1998-1999) the scheme lost the ability to deliver a positive premium against both short-term and long-term domestic low-risk assets as SR estimates presented in this study are both negative. On the other hand, Bohl et al. (2010) using the data from the period 1998 – 2004 already point out on the statistically significant underperformance of Hungarian scheme when measured against the benchmark reflecting the potential portfolio holdings, which included the local stocks and bond market indices together with local T-bills.

Finally, the results of the Style analysis present the estimated portfolio placement. As documented in the Table 21, distinctive majority (almost 88 percent) of the portfolio has been invested into the long-term local government bonds[52]. The remaining 12 percent are equally invested into the domestic and foreign equity. The predictive power of the Style analysis to explain the data "in the sample" is reflected by the R-square value of 0.65. The positive value of the Style analysis SR signals on a modest presence of the managerial ability to deliver an increased wealth through the active

[51] The results of Walker and Iglesias (2007) for Hungary over the period (1998-2007) show that: STL = 0,299; LTL = 0,425; STU = 0,504; LTU = 0,371 (for international benchmarks the U.S. T-bills and 10-year U.S. bonds).

[52] The dominant position of the long-term government bonds in the Hungarian mandatory pension scheme could be explained by the presence of the minimum return guarantee which requires PFs to deliver at minimum 85 % of the official return index of long-term government bonds in the 3-years period.

management decisions. Nevertheless, this finding is not backed up by the statistical significance.

Table 20: The estimated Sharpe ratios values for Hungarian private pension scheme:

Hungary	STL	LTL	STG	LTG	Style analysis
SR	-0,1009	-0,0333	0,2578	0,1724	0,0452
t-test	-0,6583	-0,2180	1,6371	1,1138	0,0565
Excess return	-0,0146	-0,0046	0,0434	0,0286	0,0062
Std. deviation	0,1449	0,1385	0,1683	0,1658	0,1369
No. observations	43	43	43	43	43

Source: Author's calculations

Table 21: The results of Sharpe style analysis for Hungarian private pension scheme:

HUN 3M	HUN 10Y	GER 3M	GER 10 y	HUN equity	Global equity	R-square
0,00%	87,81%	0,00%	0,00%	6,19%	6,00%	0,64691

Source: Author's calculations

3.6.2.5. Poland

Data characteristics:

- Monthly calculated returns from indexed unit values
- Period: January 2000 - June 2010
- In total 130 observation points

The mandatory private pension scheme in Poland has been established in 1999, and its financial performance in this study has been measured since January 2000. The results of the financial performance of Polish mandatory scheme (measured by the SRs) are satisfactory as all the estimated SR values are positive. This indicates that the returns of the scheme outperformed all four alternative benchmark alternatives, thus the results might also be treated as robust. Moreover, three out four SR values turned out to be significantly different from zero. The remaining measure reflecting the financial performance against the domestic 3-month T-bills was nearly significant (with t-value of 1.38). The SR estimates point out on the ability of the scheme to deliver positive excess returns with relatively low levels of volatility.

These findings are in contrast with the results presented in Stanko (2003). In his study he examines the financial performance of the Polish pension funds using various conditional and unconditional models over the period of 1999-2003, and he also finds that the SRs for most of the Polish PFs turned out to be negative in the this period. On the other hand, Walker and Iglesias (2007) show that over 1999-2005 the SRs are already positive in all observed cases[53]. Thus, the results reached in this study correspond rather with the results of Walker and Iglesias. Moreover, the results presented in Table 22 suggest, that the SR estimates for the Polish scheme are higher than in the aforementioned study. The higher value of SR signals on the more favorable connection between the excess returns and its volatility delivered by the Polish mandatory pension scheme with the longer observation period.

Interestingly, the value of the SR is higher in the case of the long-term local benchmark with respect to the short-term one, which could be explained by two factors. One of them is the presence of the inverted yield curve in the initial observation period as the returns of Polish 3-month T-bills were often higher than the returns on 10-year government bonds[54]. The other one would be the lower standard deviation of the scheme excess return over the long-term bonds. In combination, these two circumstances led to (as in the Hungarian case) the above mentioned result. Generally, the performance could be rated positively as both long-term benchmarks have been out-performed by the scheme over the period observed.

The results of the Style analysis supported by the R-square value of 0.83 suggest that most of the assets were invested into the domestic government bonds. The remaining part of the assets (around 30 percent) was invested into the Polish equity. Finally, the computed SR value for the Sharpe style analysis indicates that the PF managers have been able to bring an additional wealth increase through the active management decisions. However, again, the results of the computations show that the estimated value of SR for the style analysis is not significantly different from zero.

[53] The results of Walker and Iglesias (2007) for Poland over the period (1999-2005) show that: STL = 0.112; LTL = 0.024; STU = 0.2344; LTU = 0.1589 (for international benchmarks the U.S. T-bills and 10-year U.S. bonds were used).

[54] High returns on both 3-month and 10-year Polish bonds in the period 1999-2002 were the main reasons for negative values of SR of individual PFs as presented in Stanko (2003).

Table 22: The estimated Sharpe ratios estimates for Polish private pension scheme:

POLAND	STL	LTL	STG	LTG	Style analysis
SR	0,122746	0,14695	0,372519	0,297342	0,100051
t-test	1,381609	1,645003	3,813702	3,157096	1,130998
Excess return	0,0221	0,0257	0,0696	0,0549	0,0071
Std. deviation	0,179799	0,15468	0,186964	0,184691	0,070526
No. observations	130	130	130	130	130

Source: Author's calculations

Table 23: The results of Sharpe style analysis for Polish private pension funds:

POL 3M	POL 10Y	GER 3M	GER 10 y	POL equity	Global equity	R-square
0,466067083	0,23512	0	0	0,2988	0	0,83211559

Source: Author's calculations

3.6.2.6. Slovak Republic

Data characteristics:

- Monthly calculated asset-weighted returns from unit values
- Period: April 2005 - June 2010
- In total 63 observation points

There are 3 Slovakian pension schemes (conservative, balanced and growth) that enter into the analysis. The observation period coved the whole lifetime of all 3 schemes, which is still the shortest out of the sample. The combination of relatively short period of operation and the occurrence of the world financial crisis within this period markedly burdens the financial performance of all three observed schemes. This is already documented in the section 3.6.1. as the real returns of all three Slovakian schemes ranged from minimum positive real return of conservative scheme to the negative real returns of balanced and growth schemes.

The estimated values of SRs for each of the schemes underline the above mentioned findings as they turned out to be negative in all three cases when measured against the local (both short-term and long-term) benchmarks (see the Tables 24, 26 and 28). In fact, the SR values for local benchmarks are the lowest out of all observed schemes for the domestic T-bills and the second lowest (right after the Czech Republic) in the case of the domestic 10-year government bonds. The

underperformance against the long-term benchmarks is underlined by the strong statistical significance of each of these results (t-test values range from -3.7 to -3.2). The negative SR estimates for the short-term benchmarks are statistically significant in the case of balanced and growth schemes contrary to the conservative scheme. The results for the international benchmarks are slightly less disappointing. Even though the SR estimates turned out to be negative in most of the cases[55], the SR values are lower than in the case of local benchmarks.

To summarize, the long-term benchmark returns have not been beaten in any of the observed cases as all SR estimates turned out to negative. Moreover, these results appear to be statistically significant. Also, the results point out that schemes underperformed (with one exception) to foreign benchmarks. The disappointing financial performance of the Slovakian mandatory private pension scheme is partly given by the short observation period and the full presence of the global financial crisis within this period. The recent legislative changes introduced in 2009 could be seen as another reason for such underperformance (see the section 3.4.5.).

The results of the style analysis need to be interpreted carefully due to the low R-square values of the asset allocation models. However, the value of the SR for the scheme with highest R-square value of style analysis is negative (though not significantly different from zero), which suggests a poor quality of the managerial decisions in terms of the market selection/timing in comparison with the alternative passive investment strategy (portfolio of the same style).

Table 24: The estimated Sharpe ratios values for Slovakian conservative mandatory scheme:

Conservative	STL	LTL	STG	LTG	Style analysis
SR	-0,1060	-0,5778	0,5400	-0,0595	0,0246
t-test	-0,8333	-3,6505	3,4935	-0,4710	0,1955
Excess return	-0,0018	-0,0119	0,0117	-0,0014	0,00039
Std. deviation	0,0167	0,0205	0,0216	0,0236	0,0158
No. observations	63	63	63	63	63

Source: Author's calculations

[55] The positive value of SR, significantly different from 0, which was reached by the Conservative scheme with respect to the returns on German 3-month T-bills (t-test value of 3.49) given mainly by the low volatility of observed excess returns, is the exception.

Table 25: The results of style analysis for Slovakian conservative mandatory scheme:

SVK 3M	SVK 10Y	GER 3M	GER 10 y	SVK equity	Global equity	R-square
72,23%	14,85%	0,00%	11,36%	1,48%	0,08%	0,334

Source: Author's calculations

Table 26: The estimated Sharpe ratios values for Slovakian balanced mandatory scheme:

Balanced	STL	LTL	STG	LTG	Style analysis
SR	-0,3525	-0,5096	-0,0986	-0,3420	-0,0208
t-test	-2,5381	-3,3595	-0,7761	-2,4753	-0,1650
Excess return	-0,0186	-0,0287	-0,0052	-0,0183	-0,0007
Std. deviation	0,0528	0,0563	0,0526	0,0534	0,0321
No. observations	63	63	63	63	63

Source: Author's calculations

Table 27: The results of Sharpe style analysis for Slovakian balanced mandatory scheme:

SVK 3M	SVK 10Y	GER 3M	GER 10 y	SVK equity	Global equity	R-square
33,70%	0,00%	49,70%	0,00%	6,36%	10,24%	0,440

Source: Author's calculations

Table 28: The estimated Sharpe ratios values for Slovakian growth mandatory scheme:

Growth	STL	LTL	STG	LTG	Style analysis
SR	-0,3473	-0,4771	-0,1450	-0,3427	-0,0658
t-test	-2,5070	-3,2071	-1,1309	-2,4797	-0,5207
Excess return	-0,0229	-0,0330	-0,0095	-0,0225	-0,00261
Std. deviation	0,0660	0,0691	0,0653	0,0658	0,0397
No. observations	63	63	63	63	63

Source: Author's calculations

Table 29: The results of Sharpe style analysis for Slovakian growth mandatory scheme:

SVK 3M	SVK 10Y	GER 3M	GER 10 y	SVK equity	Global equity	R-square
42,08%	0,00%	36,89%	0,00%	7,92%	13,11%	0,650

Source: Author's calculations

3.6.3. Summary and discussion of the obtained results

3.6.3.1. Summary of the obtained results

Before summarizing and discussing the obtained results, again, the limited cross-country comparability of the pension schemes financial performance should be stressed. The ambition of this work was not to analyze whether the respective pension schemes were able to deliver an adequate level of pensions for future pensioners. Such a question is beyond the scope of this work. Rather, the applied methodology addressed the question whether the analyzed pension schemes were able to generate any premiums with respect to the country specific low-risk benchmarks over the period observed (Sharpe ratios). The complementary methodology (Sharpe Style analysis) examined the role of an active management in the process of value-generation with respect to the passive investment strategies.

In total there were six CEE countries analyzed: Bulgaria, Croatia, the Czech Republic, Hungary, Poland, and the Slovak Republic. The original intent was to come up with the dataset of the schemes returns covering the period 2000-2010. However, this had to be adjusted depending on the year of the system introduction and/or the data availability. The initial standpoint of the financial performance was provided by the observation of the real returns delivered by the respective pension schemes. The substantive influence of the world financial crisis was evident[56] from the results obtained. Consequently, the countries with shorter observation periods (SVK, BUL) managed to deliver only the negative real annual returns. Out of the countries analyzed the highest real annual returns were delivered by the Polish mandatory pension scheme.

The main body of this work focused on the assessment of the schemes ability to generate a risk premium with respect to the returns on the country specific (and international) low-risk reference benchmarks. The analysis proceeded with the estimation of the excess returns so that the ex-post Sharpe ratios for each pension scheme could be estimated. In order to identify these excess returns, the following low-risk reference benchmarks have been chosen: periodic returns on the local 3-

[56] The validity of this statement could be documented on 3 countries (Poland, Hungary and the Czech Republic). In comparison with Tapia (2008b) who covers the period 2000 - 2005, the real scheme returns dropped by 2.7 percentage points in the case of Poland, 1.6 percentage points for Hungary, and 0.5 in the case of the Czech Republic.

month T-bills and 10-year government bonds, and also on the German 3-month T-bills and 10-year bonds. To understand the SR correctly, its highest value does not necessarily mean that the observed scheme delivered the highest excess returns over the respective benchmark as the ratio also takes into account the volatility (expressed through the standard deviation of the excess returns). The ratio reflects on the relationship between scheme excess returns and its volatility, and consequently, e.g. high excess returns reached with high levels of returns volatility will result in the moderate value of SR, etc.

The results of the computations suggest that the examined schemes were not outperformed by the domestic short-term benchmarks (except for Slovakian balanced and growth schemes and Hungary). In fact, most of the SR values for domestic short-term benchmarks were positive, though the SR estimations rarely turned out to be significantly different from zero. On the other hand, all of the analyzed schemes (except for Polish mandatory pension scheme) have been outperformed by its local long-term (10-year government bond) benchmark as the SR estimates turned out to be negative (ranging from -0.84 to -0.03). The highest underperformance was tracked in the case of the Czech Republic and the Slovak Republic. The statistical significance of the results was validated in the case of the Czech Republic, the Slovak Republic and Poland.

The comparison against the international benchmarks brings similar results. The short-term international benchmark was beaten in most of the cases (except for Slovakian balanced and growth scheme) as most SRs turned out to be positive. In addition, the majority of the results were also supported by its statistical significance. Further, the comparison with the long-term international benchmarks brought a mixed success as some of the countries outperformed its benchmark returns (SRs ranging from -0.06 to 0.30). However, only the results for Poland turned out to be statistically significant from zero. In general, the results of the comparisons of schemes financial performance with the international benchmarks turned out to be more positive due to the interest rate differential and domestic currency appreciations appearing in most of the countries over the period observed (systematically lowering the benchmark returns).

Finally, the results of Sharpe style analysis suggest that in comparison with the passive investment strategies the PF managers were able to deliver a wealth increase in most of the cases. However, these results are not backed up by the statistical significance. Moreover, the portfolio composition limited only to six asset classes (four of which were used for the computation of the SRs + domestic equity index + world equity index), and the R-square values of the models used for estimation of portfolio weights in the range of 0.44 – 0.83 should be kept in mind. These circumstances lead to a relatively limited explanatory power of the results reached by the style analysis.

3.6.3.2. Discussion of the results

Generally, out of the presented findings there is one that stands above the others. It is the finding that only one of the six countries observed (Poland) managed to beat its long-term domestic benchmarks as SR turned out to be negative in all of these cases. Such a financial performance should be treated as markedly unsatisfactory. Assuming a standard shape of the yield curve[57] in long run and taking into account the schemes investment horizon (which should reflect the working age period of its participants often from ranging from 30 to 40 years), the expectation on the pension scheme returns to systematically outperform the returns on 10-year government bonds is legitimate. Such a poor financial performance documented in this study could be in some cases partially justified by the relatively short observation period of operation in combination with the occurrence of the world financial crisis. However, this argument is not valid for the schemes operating over the whole observation period (2000-2010). The disability of the schemes to generate sufficient excess returns to cover its potential losses, so that the domestic long-term benchmark could be systematically outperformed, invokes the need to revise the schemes initial design, and identify limitations hindering such a delivery. These limitations then should be addressed by the policy recommendations that would facilitate an adequate outcome. Through the identification of countries with such underperformance this study may serve as a basis for the further research in the respective countries that would come up with the analyses addressing these limitations.

[57] By the standard shape of the yield curve we mean the yield curve with the positive sloping meaning that bond yields rise as their maturity lengthens.

Regarding the financial performance of the Czech voluntary private scheme among and its comparison with other chosen CEE countries, it has been relatively satisfactory when measured against the foreign (German) benchmarks. Also, the scheme managed to beat its local short-term benchmark, although this result is not significantly different from zero. On the other hand, the strong underperformance of the scheme has been identified when the returns on the Czech government 10-year bonds were used as its reference benchmark. In fact, value of SR reached for the long-term local benchmark points out on the worst result in this category as the SR value turned out to be the highest negative.

This does not mean that the scheme delivered the highest negative excess returns with respect to this benchmark but the already high levels of negative excess return were accompanied by the relatively stable volatility of the excess returns, which resulted in the largest negative performance based on the SR indicator. The highest negative value of SR estimate reflects on the fact that the negative excess returns over this benchmark have been delivered with relatively stable persistency over the period observed. Moreover, this SR estimate is strongly statistical significant. To quantify it, in average over the period observed, the returns of the scheme have been outperformed by the Czech 10-year government bonds by 1.61 percentage points annually.

As argued in the section 3.6.2.3., such underperformance measured against the long-term domestic benchmark could be explained by the several factors. The first one is the presence of the legislative arrangement requiring the non-negative returns to be delivered every year. This measure automatically forces the managers to settle the investment strategy on (short-term oriented) “minimizing the losses” approach rather than (long-term oriented) “maximizing the returns” approach. With no incentives to deliver (or penalizations for not delivering) higher portfolio returns in long-term, the scheme provides its participants with stable but low annual returns.

Another factor hindering the PFs financial performance is the fact that the assets of the participants are not separated from the ones of PF. As a result the (operating and acquisition) costs are subtracted directly from the investment profit, which is further distributed as a net profit to the scheme participants. There is no legal limitation on these costs, and their current levels significantly burden the financial performance of

the scheme. This joint possession factor also leads to the constraint where only one investment scenario could be offered by each PF. In such a situation, the diverse risk-return preferences among participants cannot be treated accordingly, which also might have a negative influence on the financial performance of the Czech voluntary private pension scheme.

4. Concluding remarks

The Czech voluntary private pension scheme was introduced in late 1994, and since then it has experienced a substantial development. After 15 years of its existence, a time of evaluation has come. Therefore, the first aim of this work was to analyze the position of the Czech voluntary private pension scheme, identify its main features and track its recent development. The core part of this study then focused on the evaluation of the financial performance of Czech scheme with respect to other reformed private pension schemes within the CEE region.

The Czech scheme could be summarized by the following attributes: By 2009, the sector gathered the assets amounting to the 6 percent of the Czech GDP. The scheme coverage exceeds 70 percent of the total workforce, and lately it has gained an increasing popularity among employers which is being reflected through their higher participation in the scheme. In addition, it gets relatively cheaper to run the scheme due to the occurrence of the economies of scale. All these attributes could be perceived as clear accomplishments. On the other hand, the participant's contribution rate expressed relatively to the average gross wage is decreasing steadily since the scheme has been introduced. Moreover, as the assets of participants are not separated from PFs assets, the current levels of acquisition costs still markedly lower the ability of the scheme to deliver adequate returns to its participants.

The main body of this work analyzed the financial performance of the Czech private pension scheme with respect to other reformed schemes within the CEE region. The financial performance was measured by the ex-post Sharpe ratios and also with the help of the Sharpe style analysis. The findings suggest that most of the observed pension schemes outperformed their short-term local and short-term foreign risk-free (low-risk) reference benchmarks, although about half of the estimated values of SRs were not significantly different from zero. On the other hand, the underperformance of the observed schemes was identified when measured against the long-term local and long-term foreign benchmarks. These findings were especially evident in the case of domestic 10-year government bonds as none of the schemes (except for Polish mandatory scheme) managed to deliver higher returns than the returns on this reference benchmark. Assuming the standard shape of yield curve in the long-term, and given the investment horizon of the pension scheme, the expectation to

systematically outperform such a benchmark is legitimate. If this expectation is not met, it invokes the need to revise the initial design of the scheme, and to identify its weaknesses that prevent from fulfillment of such an expectation. Through the identification of the countries with such underperformance this study may serve as a basis for the further research in the respective countries that would come up with the analyses addressing these limitations. The results of Sharpe style analysis (supported by low levels of statistical significance) have suggested that through market timing and/or selection the portfolio managers generally managed to deliver a wealth increase in comparison to the estimated passive investment benchmarks.

Finally, the financial performance of the Czech voluntary private pension scheme among other reformed private pension schemes within the CEE region has been relatively satisfactory when measured against domestic and foreign short-term benchmarks. Also, the results of Sharpe style analysis are positive. However, the strong underperformance was identified in the case of both long-term benchmarks. In fact, the observed scheme performance when measured against the local long-term benchmark was the weakest out of the countries analyzed as the estimated value of the SR turned out to be largely negative. The highest negative value of SR estimate does not reflect on the delivery of the highest negative excess returns (which is also not the case) but rather on the fact that the high negative excess returns were delivered persistently (low excess returns volatility) over the period observed. Moreover, this finding is supported by its strong statistical significance. To quantify the result, during last decade the scheme returns have been outperformed by the returns of the Czech 10-year government bonds in average by 1.61 percentage points annually.

Such underperformance could be explained mainly by the following two factors. The first is the presence of the legislative arrangement requiring the non-negative returns to be delivered every fiscal year. This results in the very conservative portfolio allocations. The natural investment strategy of PF reflected in the “maximizing the long-term returns” (accepting the volatility of these returns) approach is replaced by the “preventing the short-term losses” approach. As a result, with no incentives to deliver (or penalizations for not delivering) higher portfolio returns in long-term, the scheme provides its participants with stable but low annual returns. The second factor that contributed to the scheme poor financial performance is the level of PFs

costs. As assets of the participants are not separated from the PFs assets, these costs are directly subtracted from the investment profit which is going to be distributed among the scheme participants as a net profit. Thus, the results of this study suggest that in order to become competitive in the area of scheme financial performance, these two identified factors shall be treated accordingly.

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12. Global Financial Database

13. MSCI

ANNEX I: Detailed data sources for individual countries:

I. Bulgaria

Benchmarks	Description	Source	Usage
Short Term local interest rate	Bulgarian 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Bulgarian Government 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis
Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Bulgaria Stock Exchange SOFIX Index	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX Standard (Large+Mid Cap)	MSCI	Style analysis (EE)
Exchange rate	BUL/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

II. Czech Republic

Benchmarks	Description	Source	Usage
Short Term local interest rate	Czech 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Czech Government 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis
Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Prague Stock Exchange PX-50 Index	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX	MSCI	Style analysis (EE)

	Standard (Large+Mid Cap)		
Exchange rate	CZK/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

III. Croatia

Benchmarks	Description	Source	Usage
Short Term local interest rate	Croatian 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Croatian Government 5-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis
Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Prague Stock Exchange PX-50 Index	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX Standard (Large+Mid Cap)	MSCI	Style analysis (EE)
Exchange rate	HRK/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

IV. Hungary

Benchmarks	Description	Source	Usage
Short Term local interest rate	Hungarian 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Hungarian Government 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis

Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Budapest Stock Exchange Index	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX Standard (Large+Mid Cap)	MSCI	Style analysis (EE)
Exchange rate	HUF/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

V. Poland

Benchmarks	Description	Source	Usage
Short Term local interest rate	Polish 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Polish Government 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis
Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Warsaw Stock Exchange Index (WIG)	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX Standard (Large+Mid Cap)	MSCI	Style analysis (EE)
Exchange rate	PLZ/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

VI. Slovak Republic

Benchmarks	Description	Source	Usage
Short Term local interest rate	Slovakian 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STL) Style analysis
Long Term local interest rate	Slovakian Government 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTL) Style analysis
Short Term German interest rate	German 3-month Treasury Bill Yields	Global Financial Database	Sharpe ratio (STG) Style analysis
Long Term German interest rate	German 10-year Bond Yields	Global Financial Database	Sharpe ratio (LTG) Style analysis
Local stock index	Bratislava Stock exchange Index (SAX)	Global Financial Database	Style analysis (LE)
World stock index	THE WORLD INDEX Standard (Large+Mid Cap)	MSCI	Style analysis (EE)
Exchange rate	SVK/EUR exchange rate	ECB: www.ecb.int	For computation of STG, LTG and EE

ANNEX II: Master thesis proposal

Master Thesis Proposal

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Proposed Topic:

The Efficiency of the Czech Pension System settings: Current Design and its position within CEE countries

Topic Characteristics:

For each country, the issue of pension system design is of a crucial importance as the system and its settings stand for a significant part of the state budget. The discussions about the Czech pension system during the last two decades have been concentrated mainly in the area whether, and if so then how to reform the system due to the challenges to its fiscal sustainability. So far, the World Bank recommendation to diversify sources of future pensions has been heard in the form of creation of the so called third pillar, introduced in the mid 90s, which is based on the defined contribution voluntary personal savings accumulated in the private pension funds (PFs). However, since then not much of the research has been done in the field of the efficiency of the current system design. Furthermore, as the major reform of the pension system still has to come, the evaluation of its current performance is desirable. Thus, in my thesis I would like to have a closer look at the current pension scheme design, also I want to evaluate whether the initial reform has been a success, and if there is any space for pareto-efficient system improvements. In the second part of thesis I would like to focus on the comparison of the efficiency of Czech pension system with the already more reformed systems within Central-Eastern Europe (CEE) region (Slovakia, Poland and Hungary) – more specifically I will have a look on the efficiencies of the PFs activities, and its institutional settings. Based on the results obtained some policy recommendations will be proposed. For the purpose of this study I will use data from the nationa PFs associations for the evaluation of the private PFs performance, and also the OECD data on aggregate level.

Hypotheses:

The efficiency of the current Czech pension system settings:

1. Czech funded scheme offers better performance in terms of risk-adjusted returns than PAYG system
2. The institutional setting of PF's asset allocation limits the potential performance of the funded system.
3. Current behavior of PFs management (short-term focus) is posing restrictions on the potential portfolio revenues

The comparative study of the Czech system with other CEE countries:

1. In other CEE countries the efficiency of the funded scheme offers better performance in terms of risk-adjusted returns than PAYG system
2. Within CEE countries, the PFs in more advanced stages of development (counted as % of the total assets aside of the first pillar) do not generate higher risk-adjusted returns than the ones in the less advanced stages of development

Methodology:

Concerning the pension system design literature in the first part of my thesis, I will use the qualitative literature review methodology. For the empirical part of I will employ the methodology used in Antolin (2008) for evaluating the system performance and its efficiency. This methodology analyzes the portfolio performances of PFs, and compares the performance with their own benchmarks constructed either by the country specific risk-free rate alternative (usually local government bond) or other low risk reference assets. More specifically, it contains the computation of the country specific Sharpe ratios (measuring the excess return per unit of risk), which will be later used in the attribution analysis to evaluate whether the systems of PFs have obtained risk premium or have beaten their own benchmarks or low risk references (PAYG scenario). Further, as another way of assessing the investment performance of the funded schemes of the countries observed, the Markowitz mean-variance portfolio maximization approach with historical data will be used. It will result into the comparison of the investment performance of PF with artificially constructed benchmark portfolio whose asset distribution would - for a given level of risk (variance) - have produced the highest (mean) return.

Outline:

1. Literature overview:
    a. Pension system designs
    b. The Description of the Czech model
    c. Reform outlined
2. Empirical Analysis
    - Analysis of the Czech Pension System
        i. Efficiency of the current pension scheme (PAYG vs. funded system)
        ii. Institutional Settings
        iii. Short-term focus of pension funds investment
        iv. Discussion of the results and its policy implications
    - Comparative study of the pension systems within CEE countries
        v. Efficiency of the schemes (funded system x PAYG)
        vi. Comparative analysis
        vii. Discussion of results

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